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EPA Draft Environmental Impact Statement Supplement (Tallahassee-Leon County Wastewater Management Tallahassee, Leon County, Florida)

(U.S.) Environmental Protection Agency, Atlanta, GA

Jan 90

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United States
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Region 4
345 Courtland St., N.E.
Atlanta, GA 30365

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January 1990

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DRAFT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Tallahassee - Leon County Wastewater Management Tallahassee, Leon County, Florida

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Abstract: Since the mid-1970s, wastewater management alternatives have been developed and evaluated for the Tallahassee-Leon County area. The 201 Plan, prepared by the City of Tallahassee (the City), proposed expanding the City's central sewers to serve growth areas in Leon County (the County). The 1983 EIS evaluated the 201 Plan alternatives, plus the alternative of 'no-federal-action.' Since issuance of the 1983 EIS, investigations into failures of on-site septic systems within the study area and compilation of information relating to soil types, water tables, and development density have provided data which were not available during the 1983 EIS study. In January 1988, EPA Region IV issued a Notice of Intent to prepare the Environmental Impact Statement Supplement (EIS Supplement). The EIS Supplement addresses direct and indirect impacts of wastewater management alternatives for the study area for a 20 year planning period (1990 through 2010). The EIS Supplement examines information relating to soils, water tables, development density, and on-site system failures. The impacts associated with these items, including secondary impacts of induced growth in the project area, are examined.

PB90 226119AS

PUBLIC NOTICE

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV, 345 COURTLAND STREET, NE
ATLANTA, GEORGIA 30365

Availability of the Draft Environmental Impact Statement Supplement (DEISS) entitled "Tallahassee-Leon County, Wastewater Management, Tallahassee, Leon County, Florida" is being noticed in the Federal Register by the United States Environmental Protection Agency (EPA). The DEISS concludes that the preferred alternative is a centralized approach. Wastewater will be conveyed to the south to be treated at the improved Lake Bradford Road Plant and the improved and expanded T.P. Smith Facility. Effluent disposal will be handled by spray irrigation at the expanded Southeast Agricultural Sprayfield and local golf courses. The preferred alternative is cost effective, readily implementable and has few environmental impacts.

In order to solicit further public participation on the proposed project, a Public Hearing is scheduled for August 9, 1990, and will begin at 7:00 p.m. at the City Commission Chambers, Tallahassee, Florida. Both oral and written comments will be accepted, and a transcript of the proceedings will be made. For accuracy of the record, written comments are encouraged. The Hearing Chairman reserves the right to fix reasonable limits on the time allowed for oral statements.

Persons who do not provide comments at the public hearing may respond in writing before the close of the public comment period on August 24, 1990 to Heinz J. Mueller, Chief, Environmental Policy Section, Federal Activities Branch, U.S. Environmental Protection Agency, Region IV, 345 Courtland Street, NE, Atlanta, Georgia 30365. Facsimile transmittals may be sent to EPA at (404) 347-5056.

A Final EISS (FEISS) will be published after the close of the public comment period. Reviewers should be aware that EPA will not reprint the material contained in the DEISS for the FEISS. The FEISS will comprise the following: a summary of the DEISS, EPA's decision on the preferred alternative, responses to comments received on the DEISS, the transcript of the public hearing (or a summary thereof), and any other relevant information or evaluations developed after publication of the DEISS.

(MORE ON BACK)

Copies of the DEISS are available for review at the following locations:

Leon County Public Library
1940 N. Monroe Street
Tallahassee, FL 32301
ATTN: Ms. Linda Barber
(904) 487-2665

Coleman Memorial Library
Florida A & M University
P.O. Box 78, Room 304C
Tallahassee, FL 32307
ATTN: Mrs. M. B. Crump
(904) 599-3370

Robert Manning Strozier Library
Florida State University
Tallahassee, FL 32306-2047
ATTN: Ms. Sharon Schwerzel
Head, Dirac Science Library
(904) 644-2706

A limited number of copies are available upon request from EPA at the afore referenced address.

DRAFT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

TALLAHASSEE - LEON COUNTY WASTEWATER MANAGEMENT
TALLAHASSEE, LEON COUNTY, FLORIDA

Prepared by
Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

The Comment Period for the Draft EIS Supplement will remain open until August 24, 1990. Comments and inquiries should be forwarded to:

Heinz J. Mueller
Chief, Environmental Policy Section
EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365
(404) 347-3776

Approved

Joe R. Franzmathes APR 25 1990
Greer C. Tidwell for Date
Regional Administrator

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY FOR ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

TALLAHASSEE-LEON COUNTY WASTEWATER MANAGEMENT

TALLAHASSEE-LEON COUNTY, FLORIDA

Draft (X)

Final ( )

Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

Type of Action:		
	Administrative Action	(X)
	Legislative Action	( )

EXECUTIVE SUMMARY

Purpose of and Need for Action

In 1977, the City of Tallahassee prepared a 201 Facilities Plan (201 Plan) that proposed the expansion of the City's central sewers to serve growth areas in Leon County. In 1983, the U.S. Environmental Protection Agency (U.S. EPA) prepared an Environmental Impact Statement (EIS) that evaluated the 201 Plan alternatives, plus the "no-federal-action" alternative. The No-Federal Action alternative was selected as the EIS's preferred alternative. This alternative provided for the expansion of municipal facilities until the limits of the 201 Plan Phase I expansion were reached. New growth in wastewater generation would be handled by on-site and small community systems. Since the issuance of the 1983 EIS, investigations into failures of on-site septic systems within the study area and compilations of information relating to soil types, water tables, and development density have provided data which were not available during the EIS study. Subsequently, the U.S. EPA, the City of Tallahassee, and Leon County's Board of Commissioners have determined the need to re-evaluate the selected alternative (No-Federal-Action).

The 201 Plan and the 1983 EIS were required in part because the City had intended to use federal grants to fund the majority of a proposed expansion of the City's wastewater collection and treatment facilities. The No-Federal -Action Alternative of an EIS is intended to represent how existing conditions would be altered in the future by local development pressures in the absence of federal investment. Generally, this assumed that no centralized, structural alternative would be constructed. In 1988 the City prepared a Master Sewer Plan that proposed expanding their facilities within the City boundaries and, with the County's approval, in unincorporated portions of the County using monies from a 5-year capital improvements program. For this reason the use of a No-Federal-Action alternative is no longer applicable. This EIS Supplement uses the terms centralized and decentralized for the development of system alternatives. The decentralized alternative of this study is similar to the No-Federal-Action alternative of the 1983 EIS.

The EIS Supplement addresses direct and indirect impacts of wastewater management alternatives for the study area for a 20 year planning period (1990 through 2010). The study area boundaries used in the EIS Supplement are those boundaries defined for eight service areas in the City's Master Sewer Plan (1988). These boundaries were used because the City is the only entity proposing centralization of wastewater management facilities.

Alternatives Development

The alternative development process involved the identification of two (2) centralized wastewater conveyance component options, five (5) wastewater treatment component options, seventeen (17) effluent disposal component options and their corresponding conveyance facilities, and two (2) sludge treatment and disposal component options. Combinations of these components were analyzed to develop total wastewater management system alternatives. Three basic system scenarios were devised based on the collection and treatment component as follows:

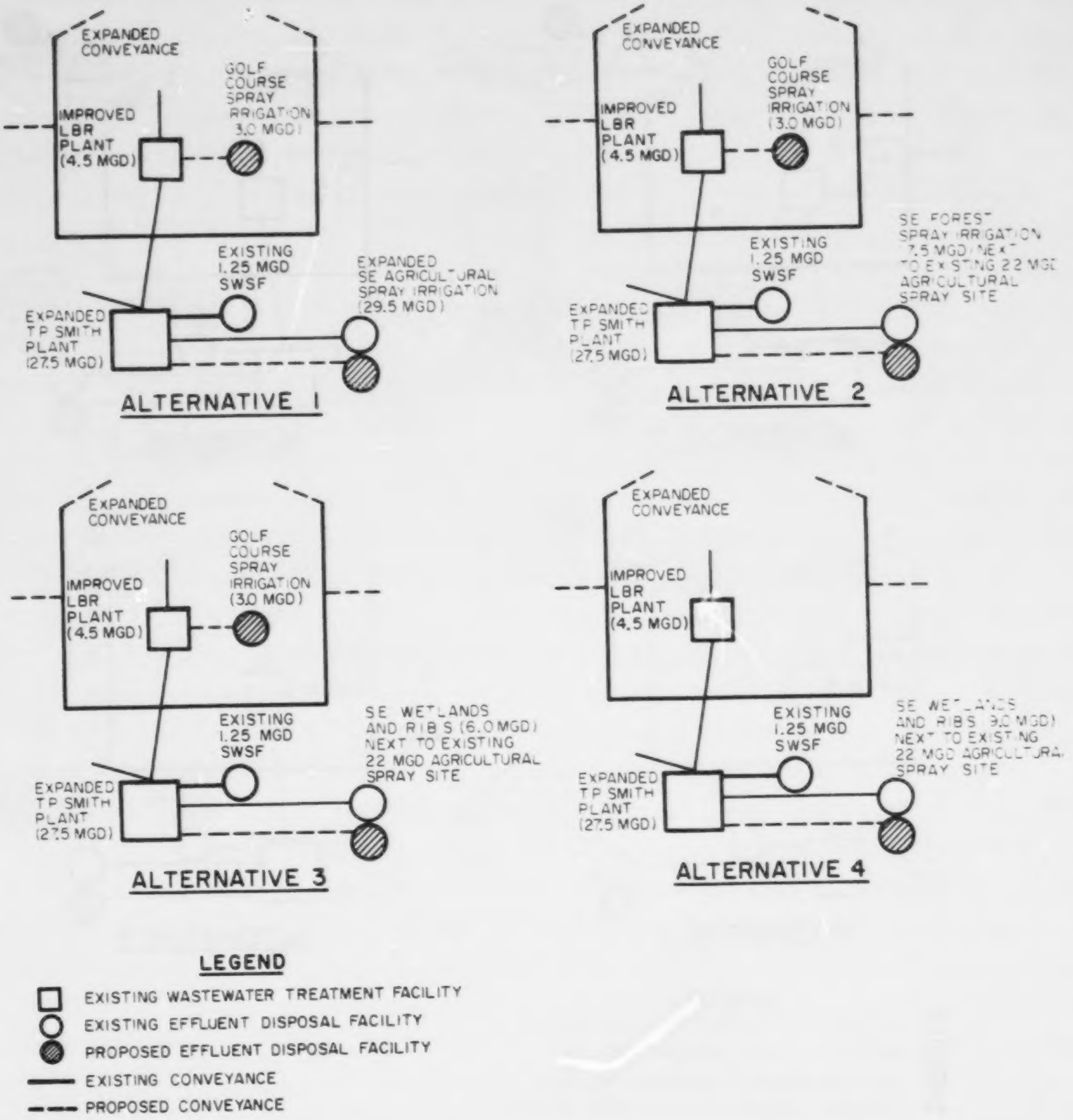
1. Centralization with conventional conveyance and treatment of wastewater in the south at the existing Lake Bradford Road Plant and T.P. Smith Facility.

2. Centralization with conventional conveyance and treatment of wastewater in the south at the existing Lake Bradford Road Plant and T.P. Smith Facility and in the north at a new Northeast (NE) Plant.

3. Decentralization with the continued use of on-lot systems and area systems to meet future wastewater needs.

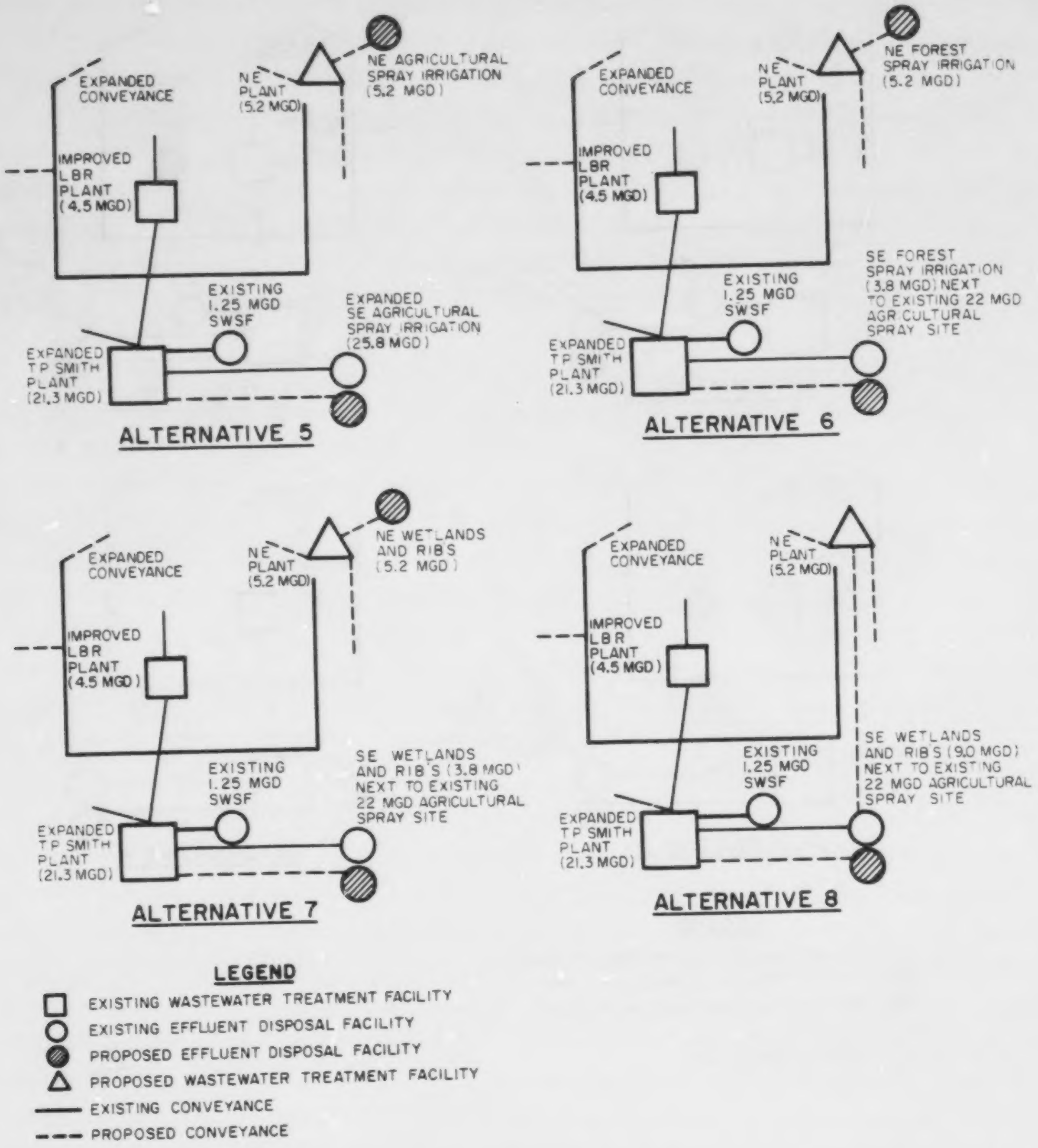
Using these scenarios, nine (9) system alternatives were developed. The selection of the wastewater effluent disposal components for the system alternatives was primarily based on capital costs. Figures ES-1 and ES-2 are schematics that illustrate the major components of the eight (8) centralized system alternatives. The ninth system alternative is the decentralized alternative. Of the eight (8) centralized system alternatives, three (3) were selected for more detailed evaluation. The three selected were alternatives 1, 2, and 7. The selection involved a screening process based on costs and preliminary environmental, technical feasibility, and implementability evaluations. The decentralized alternative was included as a fourth alternative for more detailed evaluation. Below is a brief description of each selected alternative:

Alternative 1 -	Centralization with wastewater conveyed to the south to be treated at the improved 4.5 mgd Lake Bradford Road Plant and the improved and expanded 27.5 mgd T.P. Smith Facility. Effluent disposal would be handled by spray irrigation at the expanded 29.5 mgd Southeast (SE) Agricultural


EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
GOLF COURSE SPRAY IRRIGATION (3.0 MGD)
EXISTING 1.25 MGD SWSF
EXPANDED SE AGRICULTURAL SPRAY IRRIGATION (29.5 MGD)
EXPANDED TP SMITH PLANT (27.5 MGD)
ALTERNATIVE 1
EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
GOLF COURSE SPRAY IRRIGATION (3.0 MGD)
EXISTING 1.25 MGD SWSF
SE FOREST SPRAY IRRIGATION (7.5 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED TP SMITH PLANT (27.5 MGD)
ALTERNATIVE 2
EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
GOLF COURSE SPRAY IRRIGATION (3.0 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (6.0 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED TP SMITH PLANT (27.5 MGD)
ALTERNATIVE 3
EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (9.0 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED TP SMITH PLANT (27.5 MGD)
ALTERNATIVE 4
LEGEND
EXISTING WASTEWATER TREATMENT FACILITY
EXISTING EFFLUENT DISPOSAL FACILITY
PROPOSED EFFLUENT DISPOSAL FACILITY
EXISTING CONVEYANCE
PROPOSED CONVEYANCE

CENTRALIZED WASTEWATER MANAGEMENT SYSTEM
ALTERNATIVES 1 THROUGH 4

FIGURE ES-1


EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
NE AGRICULTURAL SPRAY IRRIGATION (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
EXPANDED SE AGRICULTURAL SPRAY IRRIGATION (25.8 MGD)
EXPANDED TP SMITH PLANT (21.3 MGD)
ALTERNATIVE 5
EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
NE FOREST SPRAY IRRIGATION (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE FOREST SPRAY IRRIGATION (3.8 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED TP SMITH PLANT (21.3 MGD)
ALTERNATIVE 6
EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
NE WETLANDS AND RIBS (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (3.8 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED TP SMITH PLANT (21.3 MGD)
ALTERNATIVE 7
EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (9.0 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED TP SMITH PLANT (21.3 MGD)
ALTERNATIVE 8
LEGEND
□ EXISTING WASTEWATER TREATMENT FACILITY
○ EXISTING EFFLUENT DISPOSAL FACILITY
● PROPOSED EFFLUENT DISPOSAL FACILITY
△ PROPOSED WASTEWATER TREATMENT FACILITY
—— EXISTING CONVEYANCE
- - - PROPOSED CONVEYANCE

CENTRALIZED WASTEWATER MANAGEMENT SYSTEM ALTERNATIVES 5 THROUGH 8

FIGURE ES-2

Sprayfield and by a 3.0 mgd golf course irrigation operation using four (4) golf courses (Florida State University, Jake Gaither, Capital City County Club, and Hilaman Municipal).

Alternative 2 -	Same as Alternative 1 except that the 7.5 mgd expansion of the SE Agricultural Sprayfield would be for forest spray irrigation rather than agricultural spray irrigation.
Alternative 7 -	Centralization with 80 percent of the wastewater conveyed to the south to be treated at the improved 4.5 mgd Lake Bradford Road Plant and the improved and expanded 21.3 mgd T.P. Smith Facility. The remaining 20 percent of the wastewater would be conveyed north to be treated at a new 5.2 mgd NE Plant. Effluent disposal would be handled by artificial wetlands followed by rapid infiltration basins located adjacent to the SE Agricultural Sprayfield and in a proposed NE disposal site.
Alternative 9 -	Decentralization, which includes improving the 4.5 mgd Lake Bradford Road Plant, expanding the Killearn Lakes Plant (3.5 mgd), expanding the SE Agricultural Sprayfield (24.5 mgd), and using on-lot systems to meet the remaining future wastewater management needs.

Alternatives Evaluation

The four (4) selected alternatives were evaluated based on cost-effectiveness, reliability, implementability, and environmental impacts. The cost-effectiveness evaluation included an analysis of the alternatives' capital costs, annual operation and maintenance (O&M) costs, present worth values, and annual household costs. The reliability evaluation estimated the degree to which each wastewater treatment system could consistently achieve and maintain effluent limits for which the system was designed. The engineering and technical expertise necessary to implement the selected treatment alternatives are well established and available. The implementability analysis was based primarily on public acceptance, public agency approval, and City and County selection. The environmental analysis involved evaluation of both primary (direct) impacts and secondary (indirect) impacts. Table ES-1 is a summary of the selected system alternative rankings. This table shows Alternatives 1 and 2 to be ranked equally preferred whereas Alternatives 7 and 9 are slightly less desirable. It should be noted that the items addressed during the rating process for each of the categories do not incorporate a weighting factor. Weighting of the items would have been difficult to justify because, though certain items could be considered more "important" than others, the determination of a specific weighting value is highly subjective and dependent on the individual's or organization's needs and wants.

Description of Preferred Alternative

EPA has selected Alternative 1 to be the preferred alternative as the proposed action for the draft EIS Supplement. This selection was based on the results of the evaluation as presented in Table ES-1 and the fact that the City has experience with operating agricultural spray irrigation facilities

TABLE ES-1

SUMMARY OF SELECTED SYSTEM ALTERNATIVE RANKINGS (1)

Category	SYSTEM ALTERNATIVE			
	1	2	7	9
Cost-effectiveness (2)	3	2	1	4
Reliability	4	3	2	2
Implementability	4	4	4	3
Environmental Impacts	2	4	2	3
Total	13	13	9	12
Ranking	4	4	2	3

(1) Ranking goes from least preferred (=1) to most preferred (=4). When a tie exists for a category, both alternatives are assigned the same numerical ranking.

(2) Cost-effectiveness Overall Ranking

Capital Costs	4	3	2	1
Annual O&M Costs	1	2	3	4
Present Worth Values	3	2	1	4
Annual Household Costs	3	2	1	4
Average	2.75	2.25	1.75	3.25
Overall Ranking	3	2	1	4

for effluent disposal. The operations of these facilities has been successful in that water quality degradation has not occurred in local surface or ground water resources and that the production of crops has off-set the costs of effluent disposal operations. Alternative 1 is referred to as a centralized "treatment south" alternative. This means that all flows will be conveyed to the southwest to receive secondary treatment at either the improved Lake Bradford Road Plant or the expanded T.P. Smith Plant. The treated wastewater from the Lake Bradford Road Plant is to be disposed of via a spray irrigation operation set up at four (4) golf courses. The treated wastewater from the T.P. Smith Plant is to be transported to the expanded southeast agricultural spray irrigation fields for final disposal. Sludge generated during the treatment of the wastewater is to be disposed of by land application on land around the T.P. Smith Facility and the SW Sprayfield for dewatered sludge disposal and an expanded airport site for liquid sludge disposal.

Key Environmental Considerations and Needed Mitigation

The most critical primary environmental impacts of the preferred alternative are:

- potential groundwater and surface water contamination,
- the removal of trees, and
- the possible disruption of the Gopher frogs' migration to the north for breeding.

Groundwater and surface water contamination can result from the disposal of effluent at the golf courses and the expanded SE sprayfield. The removal of trees is the result of establishing field areas for the cultivation of agricultural crops. The disruption of Gopher frog migration results from the removal of contiguous habitat areas which are needed to provide undisturbed movement of wildlife around the field areas from the southern end to the northern end of site.

The secondary environmental impacts of the preferred alternative which generate the most concern are the impacts on land use changes and public health. The public health issue is a concern to residents living adjacent to or downstream of the SE sprayfields. Potential public health threats are related to aerosols containing pathogens traveling away from the field area and the potential groundwater contamination of the Floridan Aquifer, a drinking water source. The impact of land use changes at the SE disposal site is related to the change of silvicultural operations to agricultural operations. The concern is not so much for aesthetics or restriction of future land use potential but rather for global warming impacts. Deforestation reduces the capacity of an area of the earth to absorb carbon dioxide from the atmosphere. Carbon dioxide is the major contributor to the greenhouse effect. However, the replacement of the forest with irrigated row crops and leaving wooded wetlands and establishing wooded buffer strips will mitigate the loss of trees.

Table ES-2 lists mitigative measures that could be used to lessen the potentially detrimental environmental impacts of the preferred alternative.

TABLE ES-2

SUMMARY OF MITIGATIVE MEASURES

- Continuously monitor the quality of the effluent leaving the wastewater treatment plants. If pollutant concentrations exceed permit limitations or if there are excessively high levels of pathogenic organisms, correct problems in the treatment operations and/or design as soon as possible.
- Continuously monitor nearby surface waters and groundwater wells for water quality to detect any excessive increases in contaminants.
- Conduct agricultural operations with the primary goal being the proper disposal of effluent.
- Continuously monitor the soil conditions and the water table level at the field areas (application site) and adjust the effluent application rates accordingly.
- Monitor weather conditions to avoid spraying effluent during inclement conditions including both stormy and windy weather.
- During the design and construction phases, locate sinkholes, Karst depressions, and soils with high clay content, and avoid locating field areas at these sites.
- Implement stormwater management at the sites with facilities such as diversions, impoundments, etc.
- Preserve as many trees at the sites as possible. Trees should only be removed from the field areas and designated farm operation areas.
- Locate field areas so that the remaining forested areas of the site are not isolated but rather form a contiguous wildlife corridor throughout the site.
- Maintain a buffer zone around the field areas that is a minimum of 400 feet in width along Tram Road and 100 feet along the other external boundaries. The buffer zone should be an evergreen forested area.

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CHAPTER 3	ALTERNATIVES EVALUATION
CHAPTER 4	PERFERRED ALTERNATIVE
CHAPTER 5	EIS COORDINATION
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TALLAHASSEE-LEON COUNTY WASTEWATER MANAGEMENT
TALLAHASSEE, LEON COUNTY, FLORIDA

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ABBREVIATIONS

1983 EIS	Original, Final Environmental Impact Statement, Tallahassee-Leon County Wastewater Management, Tallahassee-Leon County, Florida (1983)
201 Plan	Tallahassee-Leon County, Florida, 201 Wastewater Facilities Plan (1977)
The City	City of Tallahassee
City MSP	City of Tallahassee Master Sewer Plan, 1987-2010 (1988)
The County	Leon County
County MW&SSP	Preliminary Leon County Master Water and Sewer Service Plan (1988)
EIS Supplement	Environmental Impact Statement Supplement, Tallahassee-Leon County Wastewater Management, Tallahassee-Leon County, Florida
EPA	United States Environmental Protection Agency, Region IV, 345 Courtland Street, N.E., Atlanta, Georgia 30365
FDER	Florida Department of Environmental Regulation, Twin Towers Office Buildings, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400
FG&FWFC	Florida Game and Fresh Water Fish Commission
LBR Plant	Lake Bradford Road Wastewater Treatment Plant
LCPH	Leon County Public Health Department
MAP Plant	Municipal Airport Wastewater Treatment Plant
NE Plant	Northeast Wastewater Treatment Plant
NPDES	National Pollution Discharge Elimination System
SE Plant	Southeast Wastewater Treatment Plant
SE Sprayfield	Southeast Wastewater Effluent Sprayfield
SW Sprayfield	Southwest Wastewater Effluent Sprayfield
TPS Plant	Thomas P. Smith Wastewater Treatment Plant
TECO	Talquin Electric Cooperative, Inc.
TLCPD	Tallahassee-Leon County Planning Department
USDA FS	United States Department of Agriculture Forest Service
USDA SCS	United States Department of Agriculture Soil Conservation Service

CHAPTER 1
PURPOSE OF AND NEED FOR ACTION

CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 PURPOSE AND SCOPE OF THE EIS SUPPLEMENT

1.1.1 Impetus for the EIS Supplement

Since the mid-1970s, wastewater management alternatives have been developed and evaluated for the Tallahassee-Leon County area in four major studies, including:

1977 - Tallahassee-Leon County, Florida 201 Facilities Plan (201 Plan);

1983 - Final Environmental Impact Statement Tallahassee-Leon County Wastewater Management, Tallahassee-Leon County, Florida (1983 EIS);

1988 - City of Tallahassee Master Sewer Plan, 1987-2010 (City MSP); and

1988 - Preliminary Leon County Master Water and Sewer Service Plan (County MW&SSP).

The 201 Plan, prepared by the City of Tallahassee (the City), proposed expanding the City's central sewers to serve growth areas in Leon County (the County). The 1983 EIS evaluated the 201 Plan alternatives, plus the alternative of "no-federal-action." The recent City MSP documented several basic alternatives (with many sub-alternatives) that reflect the City's current requirements and concepts for future wastewater management. The County MW&SSP appraised eleven alternatives; five of which entail County provision of sewer services. The other six alternatives rely on provision of sewer services by organizations other than the County. The County MW&SSP does not include the selection of a preferred alternative. The County MW&SSP will be revised and a preferred alternative selected in the near future. Sections 1.3.1 through 1.3.4 in this report describe in more detail the alternatives developed and evaluated for each study referred to above.

Since issuance of the 1983 EIS, investigations into failures of on-site septic systems within the study area and compilation of information relating to soil types, water tables, and development density have provided data which were not available during the 1983 EIS study. In consideration of this new information and the reportedly high incidence of on-site septic system failures in certain areas of northeast Leon County, the U.S. Environmental Protection Agency (EPA), the City, and the County's Board of County Commissioners have determined the need to re-evaluate the selected alternative (No-Federal-Action) of the 1983 EIS. In January 1988, EPA Region IV issued a Notice of Intent to prepare the Environmental Impact Statement Supplement (EIS Supplement).

The EIS Supplement addresses direct and indirect impacts of wastewater management alternatives for the study area for a 20 year planning period (1990 through 2010). The EIS Supplement examines information relating to soils, water tables, development density, and on-site system failures. The impacts associated with these items, including secondary impacts of induced growth in the project area, are examined.

1.1.2 Centralization Versus Decentralization

The 201 Plan and the 1983 EIS were undertaken to evaluate the cost effectiveness and the environmental impacts of expanding the municipal wastewater collection and treatment facilities in the County. These studies were required in part because the City had intended to use grants from the federal government to fund the majority of the centralized facilities' costs.

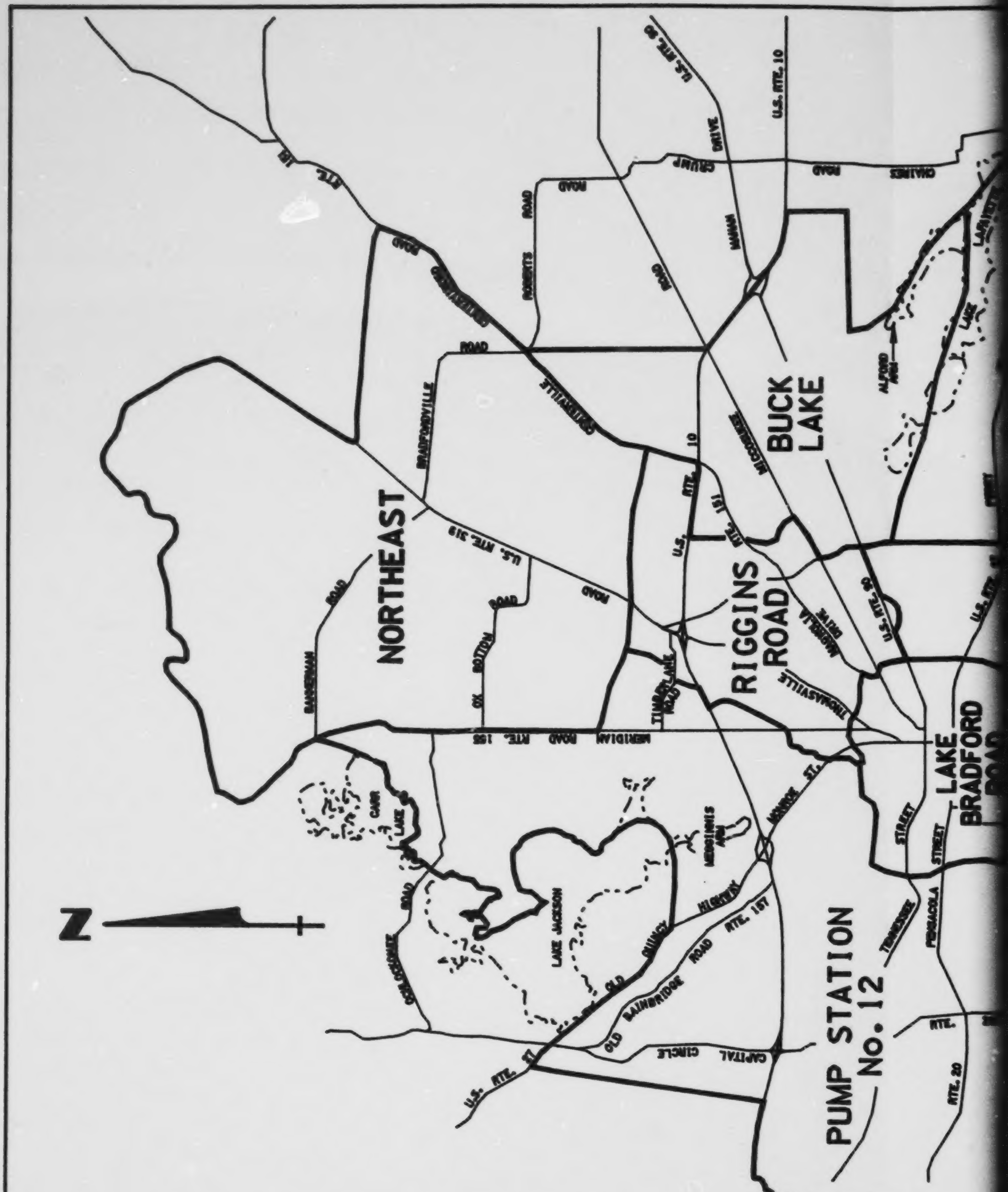
The No-Federal-Action Alternative in the 1983 EIS was the baseline for evaluating environmental impacts of the proposed structural alternatives in the EIS process. It described how existing conditions would be altered in the future by local development pressures in the absence of federal invest- ment. It was assumed a centralized, structural alternative would only be constructed based on the availability of federal funds.

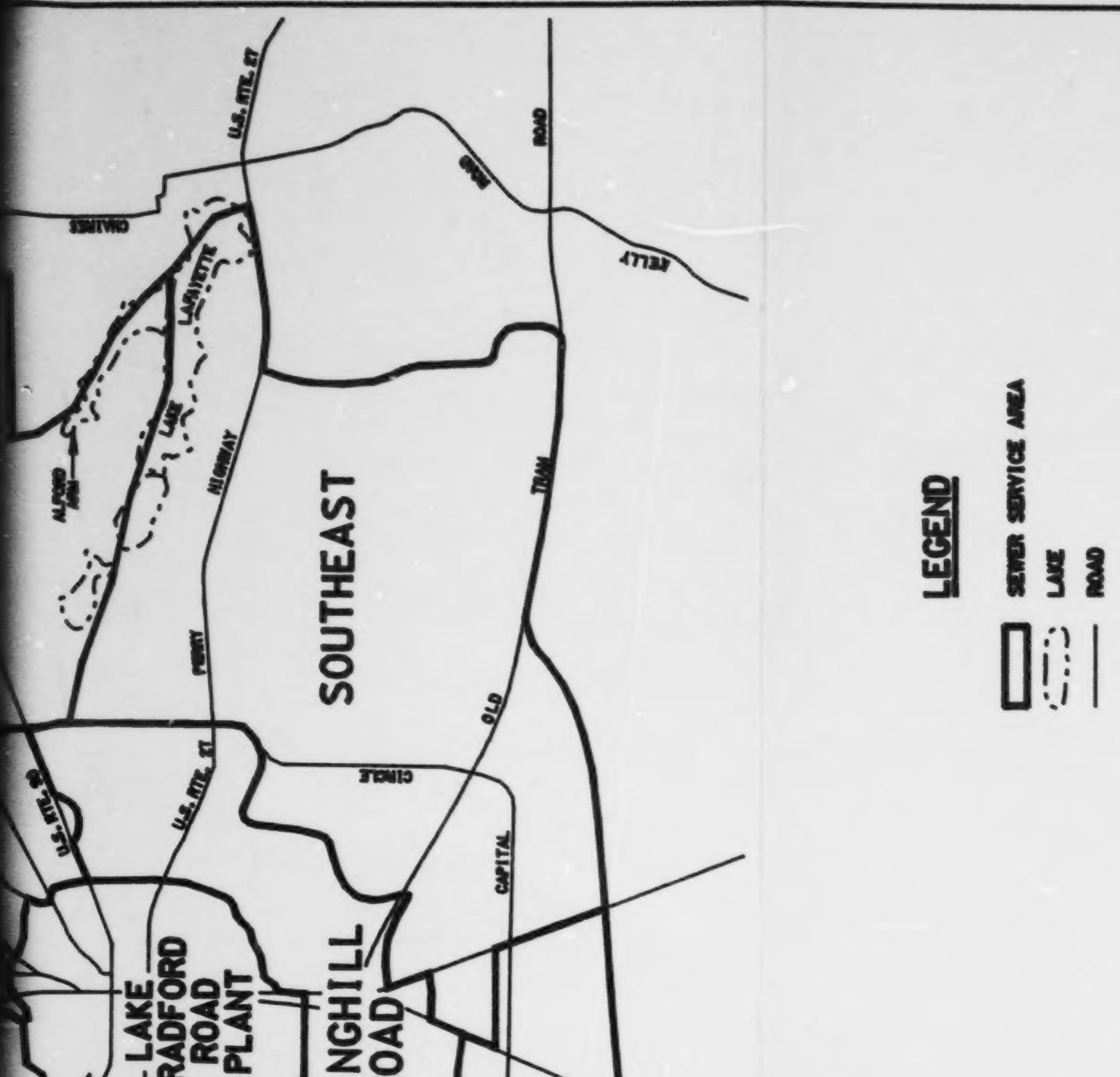
In 1988, the City of Tallahassee prepared the City MSP as an independent document detailing the major facilities needed to transport, treat, and dispose of wastewater in the Tallahassee urban area using centralized municipal facilities. Included in the scope was the development of a 5-year capital improvements program. Due to changes in federal funding policies, the City has proposed expansion of their facilities without the financial assistance of the federal government. The City plans to expand their facilities for extended service within the City boundaries and with the County's approval (refer to Section 2.2.1.2), in unincorporated portions of the County. For this reason, the use of a "No-Federal-Action" alternative is no longer applicable. Therefore, for the purpose of this EIS Supplement, the terms centralization and decentralization are used in developing system alternatives. The decentralization alternative of this study is similar in description to the "No-Federal-Action" alternative selected as the preferred alternative in the 1983 EIS. The centralized (structural) alternatives developed and evaluated in the 1983 EIS and the City MSP were used in this EIS Supplement as a basis for the centralized wastewater management alternatives. The sewer service provision alternatives presented in the County MW&SSP were also considered in this study as a basis for management options.

1.1.3 Study Area Definition

Development of alternatives for this EIS Supplement is based on centralization versus decentralization of wastewater management facilities. Because the City is the only entity proposing centralization as per their City MSP, the study area was defined as the service areas delineated in the City MSP which are illustrated in Figure 1.1.

The City MSP divided the metropolitan Tallahassee area into eight service areas, while the 1983 EIS utilized only three. A comparison of these service areas is presented below.


N
NORTHEAST
BUCK LAKE
RIGGINS ROAD
LAKE BRADFORD ROAD
PUMP STATION No. 12
LAKE JACKSON
CARR LAKE
MEGGINNIS ARM
ALFORD ARM
U.S. RTE. 319
U.S. RTE. 10
U.S. RTE. 90
U.S. RTE. 27
RTE. 151
RTE. 155
RTE. 157
RTE. 20
MERIDIAN ROAD
BANNERMAN ROAD
OX BOTTOM ROAD
BRADFORDVILLE ROAD
CENTERVILLE ROAD
ROBERTS ROAD
CRUMP ROAD
MAHAN DRIVE
MICCOSUKEE ROAD
CHAINES ROAD
THOMASVILLE ROAD
TIMBERLANE ROAD
MAGNOLIA DRIVE
MONROE ST.
OLD QUINCY HIGHWAY
OLD BAINBRIDGE ROAD
CAPITAL CIRCLE
OCHLOCKONEE ROAD
TENNESSEE STREET
PENSACOLA STREET
LAFAYETTE


SOUTHEAST
LAKE BRADFORD ROAD PLANT
SPRINGHILL ROAD
TP SMITH FACILITY
LEGEND
SEWER SERVICE AREA
LAKE
ROAD
U.S. RTE. 27
U.S. RTE. 90
U.S. RTE. 27
CHAIRES
LAFAYETTE
LAKE
ALFORD ARM
PERRY
HIGHWAY
OLD
TRAM
ROAD
KELLY
CIRCLE
CAPITAL
CIRCLE
CAPITAL
STREET
STREET
PENSACOLA
TENNESSEE
RTE. 263
RTE. 20
LAKE MUNSON

TALLAHASSEE - LEON COUNTY
ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

SEWER SERVICE AREAS

0
10000
20000
30000
SCALE IN FEET

GANNETT FLEMING ENVIRONMENTAL ENGINEERS, INC.

FIGURE 1-1

1983 EIS	City MSP
Northeast	o Pump Station No. 12 (small portion northeast of Lake Jackson) o Northeast (except small southwest portion)
Southeast	o Buck Lake (except small west portion) o Southeast (outside Capital Circle)
Southwest	o Pump Station No. 12 (except small portion northeast of Lake Jackson) o Northeast (small southwest portion) o Buck Lake (small west portion) o Southeast (small portion south of Capital Circle) o Lake Bradford Road Plant (all) o Riggins Road (except small portion north of I-10) o Spring Hill Road (all) o T. P. Smith Facility (all)

1.2 BACKGROUND AND ISSUES

1.2.1 The 1983 EIS

During the preparation of the 1983 EIS, seven issues were considered.

1. Potential public health risks associated with land application of wastewater.
2. Potential over-estimate of wastewater flow projections.
3. Potential detrimental impacts to wetlands from development in northeast Leon County.
4. Potential incompatibility of the proposed northeast treatment plant and residential use of the area.
5. Potential detrimental impacts on wetlands and the dam at Lake Lafayette from construction, operation, and maintenance of the proposed northeast plant force main to the southeast sprayfield.
6. Cost-effectiveness of renovating the Lake Bradford Road Plant (LBR Plant) versus closing it.
7. Potential impacts on the habitats of threatened and endangered flora and fauna by any of the alternatives being considered at that time.

Since the preferred alternative of the 1983 EIS was the No-Federal-Action, these issues were not necessarily resolved by the EIS, but were left for local consideration.

1.2.2 The EIS Supplement Issues

On April 19, 1988, a Public Scoping Meeting was held in the City to solicit public input for the scoping process and the identification of issues relevant to the proposed funding of wastewater treatment facilities. From the notes of the meeting and the written comments received by EPA, a list of project concerns was developed. Some of these concerns related to the original 1983 EIS issues; some were unique to the EIS Supplement situation; and others were only remotely related to either of the aforementioned.

Based upon the 1983 EIS issues, the concerns raised during the EIS Supplement Public Scoping Meeting, and the availability of information, a list of issues to be addressed during the preparation of the EIS Supplement was developed. These issues are presented below. Issues 1 through 7 are from the previous EIS, and issues 8 through 10 are from the EIS Supplement scoping process.

1. Land Application Impacts
    a. Disease transmittal by spray aerosols and animal vectors.
    b. Groundwater contamination.
    c. Long-range impacts on vegetation.

2. Wastewater Flow and Population Projections
    a. New data.

3. Development Potential in Northeast Leon County
    a. Incompatible land use.

4. Proposed Northeast Wastewater Treatment Plant
    a. Incompatible land use.

5. Northeast Force Main to Southeast Sprayfield
    a. Construction impacts.
    b. Operation and maintenance problems.

6. Abandonment of the LBR Plant
    a. Reduced environmental impacts.
    b. Economics.

7. Impacts on Vegetation and Wildlife
    a. Loss of habitat.
    b. Impact on protected species.

8. Performance of Existing Wastewater Treatment Facilities
    a. Failing on-lot/community systems.
    b. Odor problems.

9. Siting of Wastewater Treatment Facilities
    a. Socioeconomic impacts.
    b. Non-point source impacts.
    c. Accurate mapping.

10. Project Coordination with Local Agencies, Organizations, and Individuals
    a. Overlap of similar ongoing or proposed studies.
    b. Public participation.

1.3 PREVIOUS AND ONGOING STUDIES

1.3.1 Tallahassee-Leon County, Florida, 201 Facilities Plan (201 Plan)

The scope of a Step I-201 Plan is confined to planning for publicly-owned wastewater collection, treatment, and disposal systems. Other point sources of pollution, such as privately-owned package treatment plants and industrial dischargers operating under National Pollution Discharge Elimination System (NPDES) permits, are noted only if they might one day become part of the municipal system. Likewise, nonpoint source pollution has a bearing on the 201 Plan only if stormwater entering the sewers must be eliminated or treated and disposed of by the facilities proposed in the plan. The control of the sources of nonpoint pollution does not fall within the jurisdiction of the 201 Plan, but rather is the concern of 208 planning. A 208 Plan has been conducted by the Tallahassee-Leon County Planning Department (TLCPD). Through cooperative agreements between the County and City, those wastewater management issues which would be covered by both the 201 and the 208 Plans were identified to ensure a thorough investigation and to avoid duplication.

The draft 201 Plan was approved in April 1977 by the City and County Commissioners, and received initial approval from the Florida Department of Environmental Regulation (FDER) and the EPA. EPA subsequently made a decision to initiate Step II Grants for only those facilities which would relieve existing water quality problems. This decision was made, in part, due to the opposition of citizens and private organizations to portions of the 201 Plan. It was further decided that an EIS would be prepared on those portions of the 201 Plan that supported future population growth and could possibly result in significant environmental impacts. All Phase I facilities funded by EPA have been completed and include the following:

- Upgrading of 2.5 mgd Southwest Treatment Plant,
- New Southwest Holding Pond and Pumping Station,
- New 22.5 mgd Southwest to Southeast Force Main,
- New 10.0 mgd Southeast Holding Pond and Pump Station,
- Expansion of T. P. Smith Plant (TPS Plant) to 17.5 mgd,
- Expansion of Southeast Wastewater Effluent Sprayfield (SE Sprayfield) to 17.5 mgd,
- Abandonment of the Dale Mabry Plant (abandoned in 1982),
- New 17.5 mgd Sludge Handling Facility (completed in 1983), and
- Additional Interceptors and Pump Stations.

Those proposed Phase II portions of the 201 Plan which were addressed in the 1983 EIS included the following:

- New 5.0 mgd Northeast Wastewater Treatment Plant (NE Plant),
- New 60,000 Linear-foot Force Main to SE Sprayfield from NE Plant,
- Expansion of 2,000 acres Southwest Wastewater Effluent Sprayfield (SW Sprayfield),
- Expansion of TPS Plant beyond 17.5 mgd,
- Additional Interceptors to Growth Areas, and
- Abandonment of the LBR Plant.

1.3.2 Final Environmental Impact Statement, Tallahassee-Leon County, Florida, Wastewater Management (1983 EIS)

Four comprehensive alternatives were developed for the Tallahassee-Leon County area in the 1983 EIS. Each of these alternatives incorporated complete wastewater management systems for the metropolitan Tallahassee area.

In developing the alternatives, the situations presented below were considered:

- The 1983 EIS wastewater flow projection for the planning period (through the year 2000) was 22.3 million gallons per day (mgd) without conservation measures. The 201 Plan projected flow for the year 2000 was 30.4 mgd.

- The 1983 EIS identified three major wastewater generation areas: the southwest, the northeast, and the southeast. Alternatives were developed for serving these three areas.

- The evaluation of conservation measures for the 1983 EIS study showed that a flow reduction of 2.4 mgd by the year 2000 is feasible. The costs and structural configurations of each alternative were described with and without conservation.

- The only wastewater disposal options evaluated in detail were land application options. Surface water discharges and other options were eliminated as inappropriate for cost, environmental or technical reasons.

- Alternatives that produce sludge beyond the 201 Plan Phase I capacity of 17.5 mgd were to be disposed of by landspreading at the TPS Plant Site or on City-owned land adjacent to the airport.

- FDER rules require secondary treatment prior to application of effluent to the land. EPA decisions regarding funding of pre-application levels of treatment prior to land application were to be determined on a case by case basis.

- The Dale Mabry Plant was to be closed.

The wastewater management alternatives developed for the 1983 EIS were described as presented below.

Alternative 1A

- New NE Plant to provide service in the northeastern growth areas of the County and the developed portions of the northeast presently served by on-site and small community systems. Effluent from plant to be disposed of by rapid infiltration at a northeast disposal site.
- Expansion of T. P. Smith/Southwest Facility beyond 17.5 mgd to service the Southwest and Southeast Service Areas.
- Expansion of the SE Sprayfield to receive additional effluent from the T. P. Smith Facility.

Alternative 1B: This alternative was the same as 1A except that the treated effluent from the NE Plant would be conveyed to the expanded SESF for disposal.

Alternative 2: For this alternative, existing facilities would serve as a regional treatment system. The structural configuration depended upon whether or not conservation measures were implemented. Without conservation measures, the most cost-effective system is continued operation of the LBR Plant at 4.5 mgd and expansion of the T. P. Smith Facility by 0.3 mgd. With conservation measures, an expanded T. P. Smith Facility would serve the entire sewered area as a regional treatment plant with a 19.9 mgd capacity. This alternative included extensive construction of interceptors to serve the northeastern and eastern portions of the 201 Plan planning area. Effluent disposal would be carried out as in Alternative 1.

Alternative 3: Under this alternative, a new Southeast Wastewater Treatment Plant (SE Plant) would be constructed to supplement the treatment capacity of the expanded T. P. Smith Facility. The SE Plant would serve growth areas in the southeast and northeast. The T. P. Smith Facility would serve projected growth areas in the southwest and the existing service area. For both plants, effluent would be disposed of at the SE Sprayfield.

Alternative 4: This, the No-Federal-Action Alternative, was described by considering the present situation in the Tallahassee-Leon County area and projecting future conditions with no changes in public policy or private practices. Expansion of the wastewater system would continue only until the limits of 201 Plan Phase I expansion were reached. New growth in wastewater generation would be handled by on-site and small community systems. Population infilling would take place in the City's service area and some additional collectors would be necessary.

Alternative 4, "No-Federal-Action," was chosen as the preferred alternative in the 1983 EIS based upon low population growth projections and the anticipated ability of on-lot and small community wastewater treatment facilities to serve the existing and projected population.

1.3.3 City of Tallahassee Master Sewer Plan, 1987-2010 (City MSP)

The four system alternatives presented in the City MSP, prepared by William M. Bishop Consulting Engineers, Inc. (May 1988), were developed from 17 sub-alternatives, most of which involved variations in the wastewater conveyance system.

In developing the alternatives, the situations presented below were considered by the City.

- The expansion of the T. P. Smith Facility by 7.5 mgd, to 25.0 mgd, would serve the City until 1997. Since the existing T. P. Smith Facility is re-rated for an additional 2.5 mgd, the 7.5 mgd expansion will serve the city until the year 2000. An additional 4.67 mgd will be needed to carry the city to 2010. Estimates for future capacity were based on a per capita flow of 175 gallons per day.
- The most significant demand on future wastewater management facilities would come from the northwest and northeast areas of Tallahassee, followed by southeast and southwest.
- Land application by spray irrigation was the most feasible method of effluent disposal.
- Land spreading was the most feasible method of sludge disposal.
- The City would continue to operate three treatment facilities: (1) TPS Plant, (2) LBR Plant, and (3) Municipal Airport Plant (MAP Plant).
- The conveyance system on the east side and in the City was overloaded and needed immediate attention.
- The TPS Plant and LBR Plant were experiencing peak flow problems.

The four system alternatives developed in the City MSP are summarized below:

Alternative 1: This alternative involved treating all of the wastewater at either the Lake Bradford Plant or the TPS Plant. Effluent from both treatment plants would be pumped to the SE Sprayfield for disposal.

Wastewater from the Northeast and Southeast Service Areas would be collected and then transported to the TPS Plant through a new force main that would follow Centerville Road and Capital Circle. A new pump station would be constructed near the intersection of Wahnish Way and Bragg Drive to eliminate overflows in the trunkline and Springhill Road pump station.

Alternative 2: This alternative involved construction of a new NE Plant adjacent to Interstate 10 and the phasing out of the LBR Plant. Effluent from the T. P. Smith Facility would be pumped to the SE Sprayfield for disposal. Effluent from the NE Plant would be pumped through a new force main to the SE Sprayfield.

Wastewater from the NE Service Area would be pumped to the NE treatment plant through force mains serving the areas north, west, and south of the NE Plant. The Southeast Service Area would be served through the existing transmission system. A new pump station would be constructed near the intersection of Wahnish Way and Bragg Drive to eliminate overflows in the trunkline and Springhill Road pump station.

Alternative 3: This alternative involved construction of a new SE Plant in the vicinity of Tram Road and Capital Circle and phasing out of the LBR Plant. Effluent from the T. P. Smith Facility would be pumped to the SE Sprayfield for disposal. The effluent from the SE Plant could initially be pumped directly into the existing effluent force main from the TPS Plant to the SE Sprayfield.

Wastewater from the Northeast and Southeast Service Areas would be collected and then transported to the SE Plant through a new force main that would follow Centerville Road and Capital Circle. A new pump station would be constructed near the intersection of Wahnish Way and Bragg Drive to eliminate overflows in the trunkline and Springhill Road pump station.

Alternative 4: This alternative involved treating all of the wastewater at either the LBR Plant or the T. P. Smith Facility. Effluent from both treatment plants would be pumped to the SE Sprayfield for disposal.

Wastewater from the Northeast and Southeast Service Areas would be collected and then transported to the TPS Plant through a new force main that would follow Centerville Road and Capital Circle. A force main would be constructed from Riggins Road pump station to Capital Circle which would divert flow from the trunkline near Wahnish Way and Bragg Drive.

Originally, Alternative 1 was selected as the preferred alternative. This was changed later due to public opposition to the construction of a pump station at Wahnish Way and Bragg Drive. Alternative 4 was then developed and selected as the preferred alternative, providing for a Centerville Road/Capital Circle force main to divert flow from the Wahnish Way and Bragg Drive area.

1.3.4 Preliminary Leon County Master Water and Sewer Service Plan (County MW&SSP)

Leon County considered two basic premises in developing wastewater management alternatives for the unincorporated areas of the County: (1) the County remaining in a non-provider role, and (2) the County changing to a provider role. The County considered the following goals to guide the development of alternatives under both premises:

- Manage the impact of growth.
- Increase ability to respond to citizen's needs.
- Develop tools for managing services.
- Provide sewer services at lowest possible costs.

The eleven alternatives, six provider (one is the water only), and five non-provider, presented in the County MW&SSP, are summarized below.

Alternative 1. Non-Provider: This is the "status quo" alternative where the City would remain "the solid local governmental entity to authorize the planning, construction, and operation of ...sewage disposal utility services in the unincorporated area of Leon County." This would result in the expansion of the various service roles of others and the continued decline of the present role of the County in this respect.

Alternative 2. Non-Provider: This alternative is similar to Alternative 1 above except that the administration of sewer services by the County would be revised. The purpose of updating these documents would be to remove several noted deficiencies that exist in the current authorized service area and/or zone application fees, to establish a "grace period" for remaining unauthorized systems to apply for service areas with the county, to re-define the County's relationship with the City in granting extensions to the City's water and sewer zone, and to implement a program for monitoring water and sewer systems.

Alternative 3. Non-Provider: In this alternative, the County would cease to process future water and sewer service area applications altogether. In place of this task, the County would negotiate and establish assigned service areas to the existing water and sewer services providers. Under this alternative, service area boundaries could be derived using any number of criteria, and then assigned between those entities best suited to provide these services. This alternative is basically envisioned as a "one-time" assignment and all presently unauthorized service areas would be assigned to one of the providers.

Alternative 4. Non-Provider: This alternative follows the same basic logic as Alternative 3, with the exception that all presently unauthorized service areas of the County would be negotiated for assignment to the City in its entirety. In fact, the City has recently offered its proposal to the County to accomplish this very task. This proposal basically involves the City's offer to share service revenues with the County over a 30-year period of time in exchange for the exclusive granting of water and sewer service privileges within all presently unauthorized water and sewer territory.

Alternative 5. Non-Provider: This alternative involves the establishment of negotiated service area boundaries between providers, much in the same fashion that is presented in Alternative 3, but only enacted to moderate limits. Under this alternative, the County would retain its exclusive authority in the outermost regions of the County under either the existing or revised criteria as discussed in both Alternatives 1 and 2, and make assignments to providers only in those areas where immediate attention will be necessary.

Alternative 6, Provider: This alternative involves the County ceasing to grant water and sewer service to others altogether, thus allowing the County to pursue the provision of water and sewer services in unserviced areas from county-owned/operated systems.

Alternative 7, Provider (Water Only): This alternative assumes that the County would elect to enter as a provider of water services only. The basic workings of this alternative would not differ considerably from that discussed in Alternative 6 above, but would apply to the scope of water services provision only.

Alternative 8, Provider: This alternative is similar to Alternative 6, but rather involves the County entering as only a minor provider of water and sewer services while continuing to allow the further franchising of service areas by other providers. This approach would basically encompass the assumption of operation and maintenance responsibility over small isolated water or sewer systems as an alternative to having such responsibilities being accepted by others.

Alternative 9, Provider: This alternative follows the same basic approach as does Alternative 8, with the exception that systems assumed for County operation and control would be required to fit a large central system concept. This would be the situation if the County desired constructing its own sewage treatment plant, and then soliciting system connections in direct competition with the City and/or Talquin Electric Cooperative, Inc. (TECO).

Alternative 10, Provider: This alternative would basically consist of the County making contractual arrangements with a qualified outside entity to design, construct, operate, and maintain a major new sewage treatment facility.

Alternative 11, Provider: Under the pursuit of this alternative, the County would seek to assume control of existing water systems, sewer systems, or both. This alternative basically consists of the County attempting to acquire, either by purchase or by gift, existing systems inclusive of existing user populations. It offers the County its clearest means of entering the picture as a provider of water and sewer services in service areas of known quantity and demonstrated potential.

CHAPTER 2
ALTERNATIVES DEVELOPMENT

CHAPTER 2 ALTERNATIVES DEVELOPMENT

2.1 EXISTING WASTEWATER MANAGEMENT

2.1.1 City of Tallahassee

The City MSP (1988) prepared by Bishop Engineers described the City's existing service areas, interceptor lines, pumping stations, treatment plants, effluent disposal systems, and sludge handling facilities. Summary descriptions, current through September, 1989, follow.

2.1.1.1 Interceptors

The City's sewer system contains about 100 miles of pipeline with diameters ranging from 12 inches to 42 inches. The alignment of these interceptors is illustrated in Figure 2-1.

2.1.1.2 Pumping Stations

The City operates approximately seventy-five (75) pumping stations as part of the wastewater collection system. Of these, seven are considered part of the interceptor system and are located on Figure 2-1. At least two of the pumping stations are known to be overloaded during periods of extreme wet weather. These are Pump Station No. 12 and Springhill Road Pump Station. The City has already authorized projects to expand Pump Station No. 12 and divert flow away from Springhill Road Pump Station.

2.1.1.3 Treatment Facilities

The City operates three wastewater treatment facilities. They are: (1) T. P. Smith Facility (TPS Plant and SW Plant), (2) LBR Plant, and (3) MAP Plant. The locations of these facilities are shown on Figure 2-1. Table 2-1 identifies the treatment type for each facility.

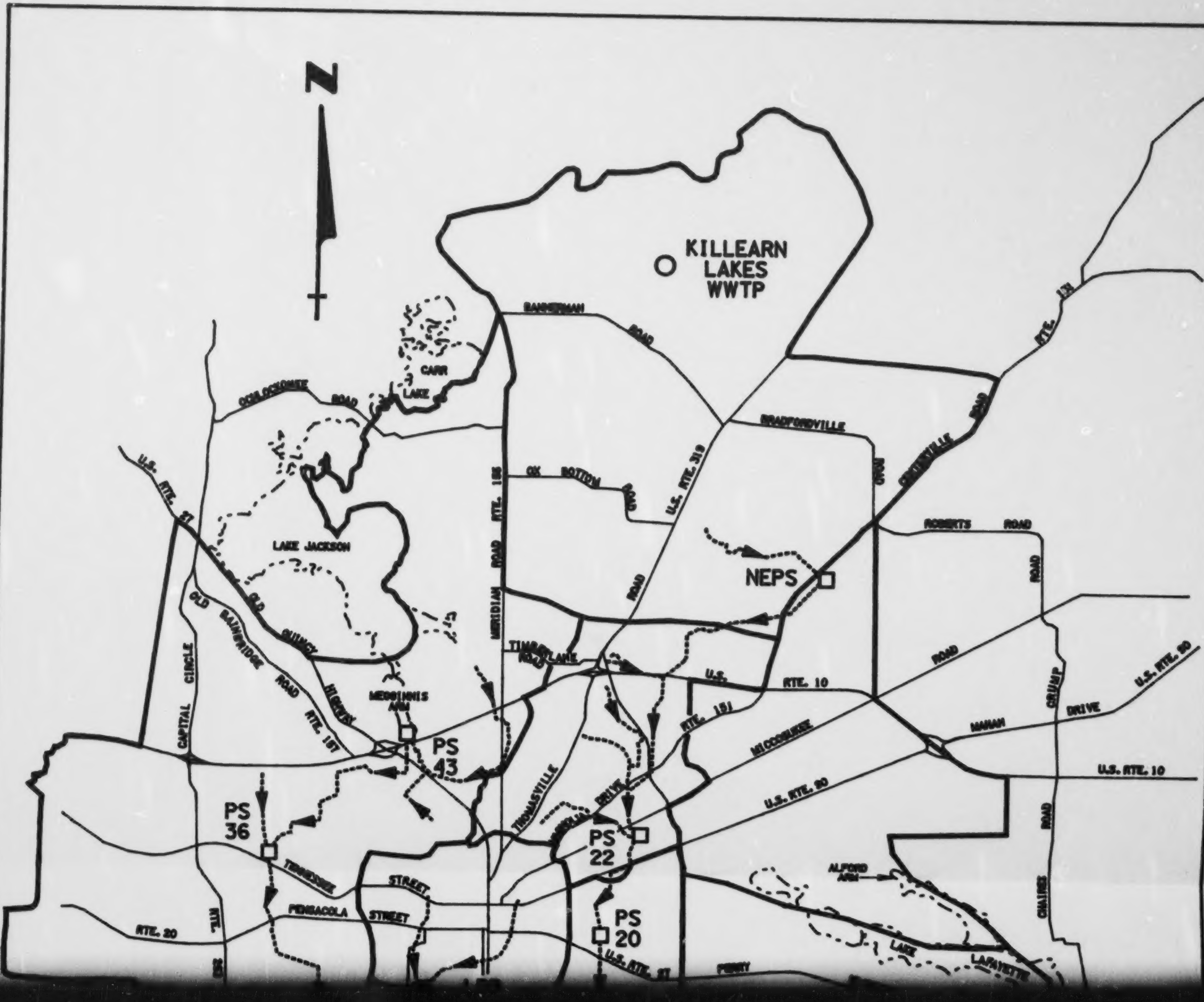
2.1.1.4 Effluent Disposal Facilities

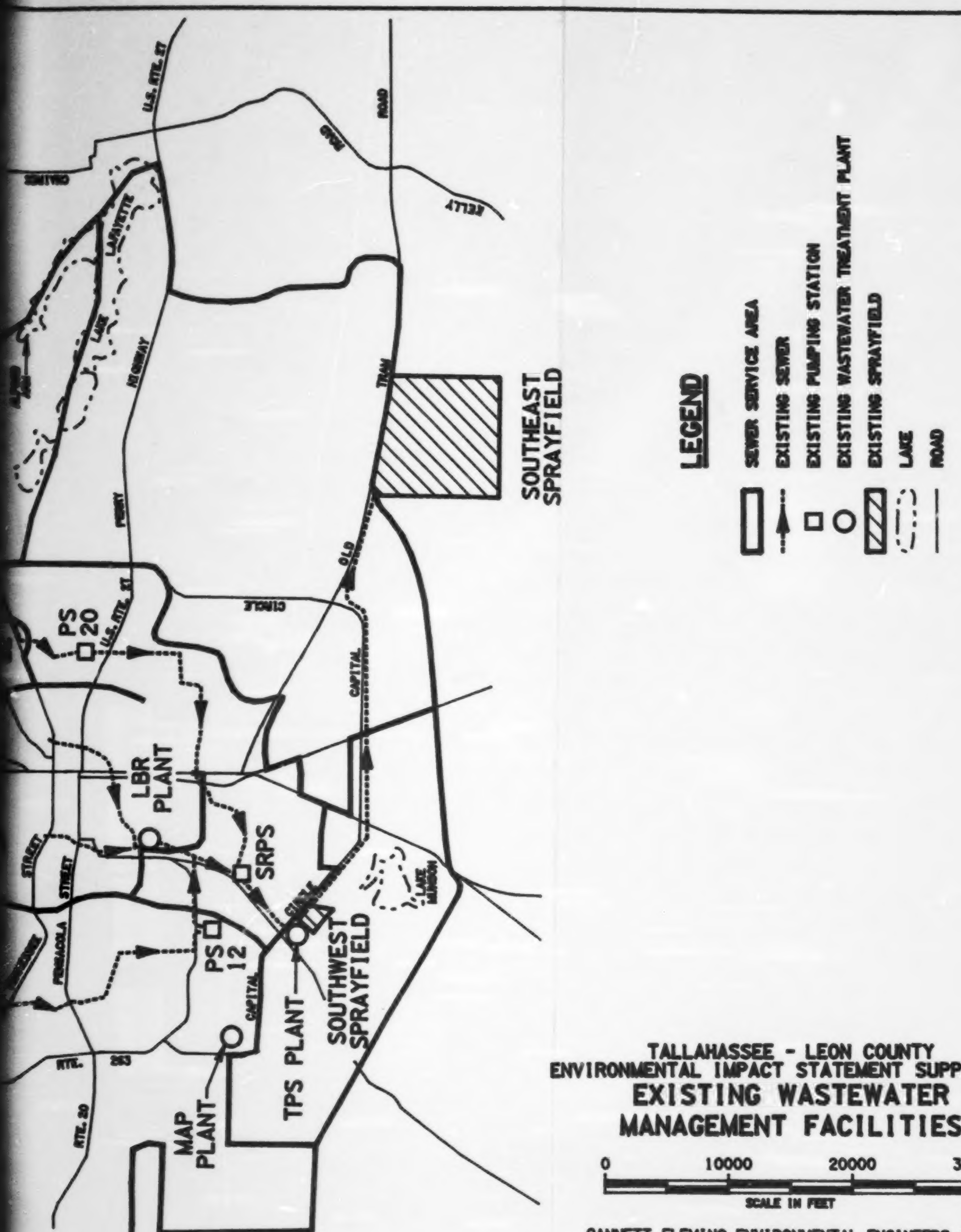
Table 2.1 also identifies the disposal technique used for each of the treatment facilities as of September 1989. With the exception of the small MAP Plant, all of the effluent from the City-owned wastewater treatment plants is disposed of by spray irrigation. The spray irrigation facility (SE Sprayfield) consists of a 1,900-acre sprayfield with a 22 mgd capacity constructed approximately eight miles east of the T. P. Smith Facility. The facility components include a 52 million gallon holding pond and 22 mgd pumping station at the T. P. Smith Facility, 40,000 feet of 36-inch force main, and a 48-million gallon holding pond and 22 mgd pumping station at the sprayfield. The sprayfield consists of thirteen center pivot irrigators. There is also a 102 acre, 1.25 mgd agricultural sprayfield adjacent to the TPS Plant referred to as the Southwest Sprayfield (SW Sprayfield). The locations of the disposal facilities are shown in Figure 2-1.

TABLE 2-1

EXISTING WASTEWATER TREATMENT FACILITIES

Plant Name	Design Flow (mgd)	Treatment Type and Disposal Wastewater	 Sludge
1. T. P. Smith Facility SW Plant	2.5	High-rate Trickling Filter Rotating Biological Contractors Spray Irrigation	Anaerobic Digestion Land Spreading
TPS Plant	17.5	Activated Sludge Spray Irrigation	Aerobic Digestion Thickening and Dewatering Land Spreading
2. LBR Plant	4.5	Trickling Filter Activated Sludge Spray Irrigation	Anaerobic Digestion Land Spreading
3. MAP Plant	0.06	Trickling Filter Evaporation/Percolation Pond	Anaerobic Digestion Land Spreading


N
KILLEARN LAKES WWTP
BANNERMAN ROAD
RTE. 131
CARR LAKE
OCHLOCKONEE ROAD
BRADFORDVILLE ROAD
CENTERVILLE ROAD
OX BOTTOM ROAD
U.S. RTE. 319
RTE. 155
MERIDIAN ROAD
ROBERTS ROAD
U.S. RTE. 27
LAKE JACKSON
NEPS
OLD QUINCY HIGHWAY
OLD BAINBRIDGE ROAD
RTE. 157
CAPITAL CIRCLE
TIMBERLANE ROAD
U.S. RTE. 10
MEGGINNIS ARM
PS 43
RTE. 151
MICCOSUKEE ROAD
MAHAN DRIVE
CRUMP ROAD
U.S. RTE. 90
U.S. RTE. 10
THOMASVILLE
MAGNOLIA DRIVE
PS 36
PS 22
TENNESSEE
STREET
PENSACOLA STREET
RTE. 20
RTE. 263
PS 20
U.S. RTE. 27
PERRY
ALFORD ARM
CHAIRES
LAKE LAFAYETTE


LEGEND
SEWER SERVICE AREA
EXISTING SEWER
EXISTING PUMPING STATION
EXISTING WASTEWATER TREATMENT PLANT
EXISTING SPRAYFIELD
LAKE
ROAD
SOUTHEAST SPRAYFIELD
SOUTHWEST SPRAYFIELD
LBR PLANT
SRPS
PS 20
PS 12
TPS PLANT
MAP PLANT
U.S. RTE. 27
ROAD
ORANGE
KELLY
ROAD
LAFAYETTE
LAKE
HIGHWAY
PERRY
TRAM
OLD
CIRCLE
CAPITAL
CAPITAL
CIRCLE
STREET
STREET
PENSACOLA
RTE. 263
RTE. 20
LAKE MUNSON

TALLAHASSEE - LEON COUNTY
ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

EXISTING WASTEWATER MANAGEMENT FACILITIES

0 10000 20000 30000
SCALE IN FEET

GANNETT FLEMING ENVIRONMENTAL ENGINEERS, INC.

FIGURE 2-1

The farm management facility at the SE Sprayfield consists of five silos, loading and unloading equipment, scales, a maintenance equipment shed, and an operators' building. This facility is used to harvest and store the crops, including corn, soybeans, and winter rye that are grown on the sprayfield.

A pumping station and force main are also in place to allow the effluent from the LBR Plant to be pumped to the holding pond at the T. P. Smith Facility. The SW Sprayfield immediately east of the TPS Plant utilizes fixed head spray guns and accepts approximately 1.25 mgd. Coastal Bermuda grass is grown on this site and is harvested as hay.

2.1.1.5 Sludge Disposal

All of the sludge from the City-owned wastewater treatment facilities is disposed of by some form of land application. The majority of sludge is landspread in the liquid form on land the City owns around the municipal airport. Approximately 456 dry tons/year, or 0.31 dry tons/mgd of plant flow, of anaerobically digested sludge is hauled from the LBR Plant. The TPS Plant is currently generating 1,909 dry tons/year, or 0.42 dry tons/mgd of plant flow, of aerobically and anaerobically digested sludge.

The T. P. Smith Facility has a dissolved air flotation unit which is used to thicken aerobic digested sludge. The thickened sludge is usually hauled directly to the airport for landspreading. However, the thickened sludge can also be sent to one of five belt presses at the site for dewatering. Sludge that has been dewatered is distributed on the plant grounds and the sprayfield adjacent to the treatment plant.

The actual acreage available for sludge disposal by landspreading consists of 490 acres at the municipal airport, 102 acres at the sprayfield next to the T. P. Smith Facility, 12 acres of area around the T. P. Smith Facility grounds, and 202 acres of City-owned pine forest west of the municipal airport, for a total of 806 acres.

2.1.2 Talquin Electric Cooperative, Inc. (TECO)

TECO owns and operates six community wastewater treatment facilities in Leon and Wakulla Counties providing wastewater services in five geographic locations. Three of these facilities serve communities located in Leon County.

The Lakewood Community Wastewater Treatment Facility (Lakewood Facility) located in western Leon County is a two-plant complex with a total of 0.3 mgd of wastewater treatment capacity. At present, the Lakewood Facility serves approximately 450 accounts, primarily residential, but including a limited amount of commercial and industrial development.

The Meadows Wastewater Facility (Meadows Facility) is located in east Leon County with a total treatment capacity of 0.07 mgd. This facility serves 215 residential accounts.

TECO's newest, and soon to be largest wastewater treatment facility, is located in northern Leon County at Killearn Lakes. At present, the Killearn Lakes plant is a 0.10 mgd plant, but engineering design is underway to expand this facility by 0.25 mgd for a total capacity of 0.35 mgd. This plant is serving approximately 100 residential units and a small number of commercial operations. The location of the plant is shown in Figure 2-1.

2.1.3 Leon County

The County does not currently own or operate any wastewater management facilities and has stated in the past that it does not desire, except as a last resort, to become a provider of these services. The County's present role in the area of sewer services is to authorize and monitor sewer system franchises to other providers in unincorporated areas.

The current extent of sewer system franchises within the County involves those areas authorized to the City, TECO, and other small private entities. The County MW&SSP identified nine community wastewater systems in addition to TECO's facilities. Four of these are authorized and five are unauthorized, according to FDER and Leon County Public Health Department (LCPH) records. The County's position concerning these additional private providers is that they are important for providing service to remote, rural areas of the County and will be considered on an individual basis for future small developments. However, they are not capable of providing the level of sewer services addressed in this EIS Supplement and subsequently are not considered as potential providers in this report.

2.1.4 On-site Wastewater Management

On-lot treatment and disposal systems are in common use in the Tallahassee-Leon County area. The systems most frequently used are septic tanks with either subsurface or mound drainfields. Only a few areas within the City limits utilize on-lot systems and they are progressively being added to the City's sewer system. The area between the city limits and the outer limits of the wastewater service areas include small (five to ten lots) and larger subdivisions that are utilizing on-lot systems. This area and the remainder of the County also include isolated small clusters and single resident on-lot systems.

Septic tank drainfield failures have been investigated and documented for the Killearn Lakes Subdivision area. Generally it was found that the combination of poor soil conditions (slowly permeable soils), water table elevations (artificially perched on confining layers), stormwater runoff ("sheet flow" drainage system), and the density of development (small lots of 1/4 acre) were the major factors involved. The study done for this area by the Leon County Public Health Unit recommended installing a central sewage system and an adequate stormwater collection system. It also advised that restrictions should be made for issuing on-site sewage disposal system permits.

2.2 BACKGROUND INFORMATION

2.2.1 Regulatory Criteria

2.2.1.1 Effluent Disposal

FDER regulates effluent disposal pursuant to the Florida Administrative Code (FAC), Chapter 17-6 Wastewater Facilities and Chapter 17-610 Reuse of Reclaimed Water and Land Application. Specific regulations that have severely restricted or eliminated the use of particular disposal techniques for the study area include the following:

- Surface water discharge - FDER has classified the Ochlochonee and St. Marks Rivers as Special Waters, thereby imposing a zero effluent limitation.
- Deep well injection - FDER requires (1) the identification of a saline formation that has a dissolved solids concentration of 10,000 mg/l (preferably two confining geological layers should be present between this saline zone and a freshwater zone), and (2) the availability of reasonable transmissivities (rate of flow into aquifer). USDA Soil Conservation Services (SCS) has stated that there are few or no confining layers separating the fresh- water and saline layers of the Floridan Aquifer, which is the main water supply source for the study area. However, there is a possibility of an anhydrite layer below the limestone formation of the Floridan Aquifer that might serve as a confining layer, but excessive depths (3,500 feet or greater) and probable low permeabilities limit the potential for deep well injection. A test well drilled in 1977 in Gainesville, Florida, showed little potential for water disposal and the project was terminated.

2.2.1.2 Sewer Expansion

County Ordinance 80-29 regulates sewer expansion in unincorporated portions of the County. This ordinance includes provisions for an application procedure that is to be used in securing a franchise for providing water or sewer service by private providers, or by the City, in the event that the area to be serviced is not contiguous to the City's existing service zones.

The City/County Water and Sewer Agreement regulates sewer expansion in unincorporated portions of the County by providing a stream-lined application procedure for use by the City in performing contiguous area expansions of its designated water and sewer service zones.

As stated in the County MW&SSP, the County has attempted to use these regulatory documents to bring all water and sewer systems in unincorporated areas under its authority. Such efforts have met with limited success in that there are still a number of existing water and sewer systems in the County which have failed to come into compliance with Ordinance 80-29.

2.2.2 Population Projections

Population estimates by traffic zone (May, 1988) were obtained from the TLCPD. The estimates used in this EIS Supplement are for the medium growth scenario and include the planning years 1990, 2000, and 2010. Estimates of the population projections for the EIS Supplement's service areas were determined by overlaying the service area boundary map and the traffic zone map. The percentage of each traffic zone lying within the service area boundaries was determined and multiplied by the corresponding population count for each traffic zone.

Based on the traffic zone population projections, the pattern of population growth shows growth areas clustered in the portion of the County north of the City and not evenly dispersed throughout the County. Ownership of undeveloped land surrounding the City could be a limiting factor in the future growth of the area, particularly for those areas owned by the USDA Forest Service (FS) or St. Joseph's Paper Company.

Table 2-2 presents the estimates for the sewered, unsewered, and total populations in each service area from 1987 to 2010. The sewered population refers to those residents or equivalent units to be serviced by centralized wastewater treatment and disposal facilities. The unsewered population refers to those residents or equivalent units to be serviced by on-lot and/or area facilities. The percentage of the total population that would be sewered in the future was determined by analyzing the characteristics of each traffic zone in the service area and using the percentage served values for each service area provided in the City MSP.

Parts of the traffic zones north of Bannerman and Bradfordville Roads of the Northeast service area are not included in the population projections. TECO's Killearn Lakes facility currently serves a large portion of this area. In addition, traffic zones south and east of Capital Circle and Old St. Augustine Road of the Southeast service area are assumed to remain unsewered with the exception of a small portion of traffic zone 358 which is currently part of the City's service area. These areas contain developable land with soils that have been determined by the USDA SCS to have only slight to moderate limitations for septic tank drainfields. In addition, the County MW&SSP has identified these zones as areas with "surplus septic acreage" based on proposed development and soil characteristics.

2.2.3 Flow Projection Analysis

Monthly average wastewater flows at the TPS/SW Plants and the LBR Plant were obtained from the City for the years 1983 through July, 1988. These flow values were analyzed to determine a base flow estimate for each service area. The peak monthly average flow on record for the study area was found to be 21.61 mgd for the month of March 1988. This value was, therefore, selected to be the base flow estimate.

Wastewater flow increases for the future were based on the medium population projections presented in the previous section and a per capita flow rate for future growth of 140 gpcd. This estimated flow rate includes commercial and industrial flows as a part of the residential flow. Table 2-3 lists the wastewater flow projections for each service area.

TABLE 2-2

POPULATION PROJECTIONS BY SERVICE AREA

	Centralized Sewered Population				Unsewered Population(1),(2)				Total Population			
Service Area	1987	1990	2000	2010	1987	1990	2000	2010	1987	1990	2000	2010
Lake Bradford Road	36,618	36,514	36,452	36,443	0	0	0	0	36,618	36,514	36,452	36,443
P.S. No. 12	31,352	37,211	48,497	55,271	13,437	9,303	5,389	2,909	44,789	46,514	53,886	58,180
Riggins Road	17,795	20,083	23,061	29,596	0	0	0	0	17,795	20,083	23,061	29,596
Northeast	6,145	8,070	12,396	16,938	6,964	7,808	8,469	8,388	13,109	15,878	20,865	25,326
Springhill Rd	24,293	25,668	28,213	30,427	0	0	0	0	24,293	25,668	28,213	30,427
T. P. Smith	499	1,039	1,537	1,948	1,495	1,038	659	487	1,994	2,077	2,196	2,435
Southeast	565	1,580	2,234	4,777	7,211	7,489	12,898	17,434	7,776	9,069	15,132	22,211
Buck Lake	442	1,010	2,920	9,199	3,975	4,039	4,380	2,300	4,417	5,049	7,300	11,499
Totals	117,709	131,175	155,310	184,599	33,082	29,677	31,795	31,518	150,791	160,852	187,105	216,117

(1) Includes populations using on-lot and small community wastewater treatment and disposal facilities.

(2) Based on service percentages provided in the City MSP, Table 4.1-B.

TABLE 2-3

FLOW PROJECTIONS FOR CENTRALIZED SERVICE

Service Area	Increase in Population Since 1987			Base Flow (MGD)	Total Projected Flow (MGD)		
	1990	2000	2010		1990	2000	2010
Lake Bradford Road	-104	-166	-175	6.88	6.87	6.86	6.86
P.S. No. 12	5,859	17,145	23,919	5.18	6.00	7.58	8.53
Riggins Road	2,288	5,266	11,801	3.10	3.42	3.84	4.75
Northeast	1,925	6,251	10,793	1.66	1.93	2.54	3.17
Springhill Rd	1,375	3,920	6,134	4.46	4.65	5.01	5.32
T. P. Smith	540	1,038	1,449	0.13	0.21	0.28	0.33
Southeast	1,015	1,669	4,212	0.13	0.27	0.36	0.72
Buck Lake	568	2,478	8,757	0.07	0.15	0.42	1.30
Totals	13,466	37,601	66,890	21.61	23.50	26.89	30.97

Both the base flow estimate of 21.61 mgd and the per capita flow rate for future growth of 140 gpcd were agreed upon for use in this study by US EPA, the City, and FDER.

The alternative development process of the EIS Supplement requires distinguishing between expanding service to accommodate infilling within the City's existing service area and expanding service to handle additional areas outside of the existing service area boundaries. Also, the current and proposed service provided by TECO in the study area must be accounted for in the alternatives. Table 2-4 summarizes the flow estimates for the various categories. These estimates were determined by overlaying the traffic zone map with the service area map, and the Leon County Planning Department sewer service franchise map. In cases where existing flow values were available, but the numbers of customers served were not, the flow rate of 140 gpcd was used to calculate a population estimate.

2.2.4 Flow Reduction Measures

Flow reduction measures refer to water conservation techniques. These measures are nonstructural techniques which can reduce treatment operating costs, relieve overloaded wastewater treatment, collection and disposal facilities, and reduce the capacity required for new facilities. The non-structural measures with potential application in the Tallahassee Leon County area include plumbing codes, flow-control devices, and educational programs to reduce water use and the resulting wastewater flow.

Table 2-5 shows the list of assumptions used in estimating the potential for wastewater flow reduction in the study area. The effects of these flow reduction measures on wastewater flow projections were estimated by considering that per capita reductions in wastewater flows at new and renovated homes are estimated at 20 gpcd for residents and 6.75 gpcd for commercial/institutional employees based on the assumptions. These flow rate reductions result in a per capita flow rate of 117 gpcd for new growth after 1990. Flow projections for Leon County with the simulated water-saving fixtures are shown on Table 2-6. The effect of water-saving fixtures at new and renovated residences and commercial/institutional establishments is to reduce projected year 2010 average flows to treatment plants from 30.97 to 29.75 million gallons per day (mgd). This amounts to only a 4% reduction but is considered a reasonable figure because water-saving devices will not be required for existing or non-renovated houses.

Such a water conservation program would not be difficult to implement nor would it require significant sacrifices by people in new or renovated structures. Water-saving toilets and shower heads have been used without complaints or public health concerns in other areas. Operation and maintenance of fixtures would not be costly or frequent.

The use of these water-saving devices will, however, reduce water and sewer revenues. Other adverse impacts include initial costs and increased concentrations of wastewater constituents reaching a wastewater treatment plant.

TABLE 2-4

POPULATION AND FLOW PROJECTION SUMMARY

	Population	Flow (mgd)	
I. Base Year 1987			
A. City's Existing Service Area			
Total	139,128	24.61	
Served by City	117,709	21.61	
Served by On-lot	21,419	3.00	
B. Proposed Master Plan Expansion Area			
Total	11,663	1.63	
Served by TECO	714	0.10	(1)
Served by On-lot	10,949	1.53	
C. Total Study Area			
Total	150,791	26.24	
Served by City	117,709	21.61	
Served by TECO	714	0.10	(1)
Served by On-lot	32,368	4.53	
II. Design Year 2010			
A. Centralized Alternatives			
Total	216,117	35.38	
Served by City	184,599	30.97	(6)
(Base)	(117,709)	(21.61)	
(Infilling)	(42,957)	(6.01)	(3)
(Expansion)	(23,933)	(3.35)	
Served by TECO	2,500	0.35	(2)
Served by On-lot	29,018	4.06	
B. Decentralized Alternative			
Total	216,117	35.38	
Served by City	138,352	24.50	(4)
(Base)	(117,709)	(21.61)	
(Infilling)	(20,643)	(2.89)	
(Expansion)	(0)	(0)	
Served by TECO	2,500	0.35	(2)
Served by On-lot	75,265	10.53	(5)

(1) Only includes the Killearn Lakes area (0.1 mgd) because the service areas of Lakewood (0.3 mgd) and The Meadows (0.07 mgd) are outside of the study area even though the treatment facilities are inside the study area.

(2) This provides for the planned expansion at the Killearn Lakes facility to allow it to receive 0.35 mgd flows.

(3) This assumes all infilling growth will be served by 2010.

(4) This is the maximum flow that can be managed by the City's facilities at their current levels:

- LBR Plant - 4.5 mgd
- TPS Plant - 20.0 mgd (rerated)
24.5 mgd

(5) An alternate version of the Decentralized Alternative could involve the expansion of area facilities to handle some of wastewater flow that is indicated to be received by on-lot systems. The decision to use on-lot versus area facilities should be made based on the soils and/or density of development.

(6) The evaluation of centralized alternatives was based on a design flow of 30.97 mgd because the remaining study area flow, 4.41 mgd (34.38-30.97), is not being considered for centralized service as described in Section 2.2.2.

TABLE 2-5

ASSUMPTIONS FOR ESTIMATING POTENTIAL FOR FLOW REDUCTIONS

1. Water-saving devices will be required only for residences and establishments built or renovated beginning in 1990.

2. No devices will be installed at faucets.

3. Conventional residential toilets use 5 gallons per flush; conventional commercial/institutional toilets use 4.5 gal/flush. Water-saving toilets will use 3.5 gallons per flush or 30 and 22 percent less water, respectively, than conventional toilets.

4. Conventional shower heads emit 6 gallons per minute; water-saving shower heads emit 3.5 gallons per minute or 42 percent less water than conventional shower heads.

5. Each resident flushes a toilet 5 times per day. Each employee/institutional resident flushes a toilet 3 times per day.

6. Each resident and 30 percent of the employee/institutional population takes a five-minute shower each day. Time to take a shower is assumed to be the same with and without water-saving shower heads.

7. 15 percent of existing residences will be renovated between 1990 and 2010 requiring the installation of water-saving toilets and shower heads. This assumption is based on an average age for home renovation of 50 years and that 15 percent of existing homes will be 50 years of age by the year 2010.

8. The per capita wastewater flow rate of 140 gpcd used for future growth consists of the following components: 75 gpcd for residential flows, 10 gpcd for inflow and infiltration in the collection system, and 55 gpcd for commercial and industrial flows.

9. 40 percent of the residents are working at establishments outside of the home.

TABLE 2-6

FLOW REDUCTION PROJECTIONS BY SERVICE AREA

Service Area	Increase in Population Between 1990 and 2010	1990 Base Flow (MGD)	Projected 2010 Flow (MGD)		Estimated Reduction
			Without Flow Reduction Measures	With Flow Reduction Measures	
Lake Bradford Road	-71	6.87	6.86	6.86(1)	0.00
P.S. No. 12	18,060	6.00	8.53	8.11	0.42
Riggins Road	9,513	3.42	4.75	4.53	0.22
Northeast	8,868	1.93	3.17	2.97	0.20
Spring Hill Road	4,759	4.65	5.32	5.21	0.11
T.P. Smith	909	0.21	0.33	0.32	0.01
Southeast	3,197	0.27	0.72	0.64	0.08
Buck Lake	8,189	0.15	1.30	1.11	0.19
Totals	53,424	23.50	30.97	29.75	1.22

(1) This results from a decrease of population by 71 with an average flow value of 140 gpcd.

Benefits which would be obtained from 1.22 mgd of lower flow in the year 2010 are the following:

- Less need for expansion of wastewater collection, treatment and disposal systems.
- Less need for expansion of water supply wells, treatment, distribution and storage systems.
- Lower operation, maintenance and energy costs for wastewater and water supply systems.
- Reduced size of geographical area which is impacted by the disposal of wastewaters.
- Groundwater sources are better conserved for future use.
- Improved chances for proper operation of on-site wastewater treatment and disposal systems.
- Lower sewer, water and energy costs for each water-conserving residence and establishment.
- National water conservation goals are supported by responsible action.

The wastewater management alternatives selected for detailed evaluation in this report (Refer to Section 2.4.6) are evaluated with and without flow reduction measures to demonstrate the positive effects of flow reduction measures and to address the "worst case" scenario, respectively.

2.3 DESCRIPTION OF WASTEWATER MANAGEMENT COMPONENTS

2.3.1 Alternative Wastewater Conveyance Configurations

The City has a well established conventional wastewater conveyance system consisting of gravity sewer lines, pump stations, and force mains. Alternative wastewater conveyance components have been identified for service area expansions. These alternative components are related to the location of the treatment components. Table 2-7 summarizes the alternative conveyance components. Components C1 and C2 include the costs for conveyance of collected wastewater to treatment facilities. The remaining components include the costs for conveyance of treated wastewater to disposal facilities. It should be noted that the pump stations to be constructed at the disposal sites are not included in the conveyance costs of this table but are made a part of effluent disposal facility costs of Table 2-9. Sections A-1 and A-2 of Appendix A describe in more detail the elements of the wastewater conveyance components since they contribute significantly to a total system alternative's capital costs. The configurations of wastewater conveyance components C1 and C2 are illustrated on Figures 2-2 and 2-3, respectively.

2.3.2 Alternative Wastewater Treatment Facilities

The FDER requires secondary level of treatment for public and private wastewater treatment facilities. The treatment process must achieve a ninety percent (90%) removal of biochemical oxygen demand (BOD), and total suspended

TABLE 2-7

ALTERNATIVE WASTEWATER CONVEYANCE COMPONENTS(3)

			Costs (Thousand $)				
ID	Description	Design Flow (mgd)	Item	Capital(1)	Annual O&M	Length of Pipe (feet)(2)	Number of Pump Stations
C1	Treatment South, Conveyance to Lake Bradford Road Plant and T. P. Smith Plant	31.0	Sewer	30,027	188	224,535 FM	18
			Pump	10,424	216	125,000 GS	
			Contingency	12,135	-		
			Total	52,586	404		
C2	Treatment North and South, Conveyance to Lake Bradford Road Plant, T. P. Smith Plant, and new NE Plant	31.0	Sewer	19,108	155	167,335 FM	17
			Pump	8,743	178	121,100 GS	
			Contingency	8,356	-		
			Total	36,207	333		
C3	Conveyance from T. P. Smith Plant to SE Disposal Site	2.5	Holding Pond	311	-	42,000 FM	(expand existing pump station)
			Sewer	866	8		
			Pump	109	14		
			Contingency	386	-		
			Total	1,672	22		
		3.8	Holding Pond	472	-		
			Sewer	1,317	12		
			Pump	165	22		
			Contingency	587	-		
			Total	2,541	34		
		7.5	Holding Pond	932	-		
			Sewer	2,600	23		
			Pump	326	43		
			Contingency	1,157	-		
			Total	5,016	66		
		9.0	Holding Pond	1,119	-		
			Sewer	3,120	27		
			Pump	391	52		
			Contingency	1,389	-		
			Total	6,019	79		
C4	Conveyance from T. P. Smith Plant to Forest Service Land Near Airport	5.0	Sewer	1,568	8	17,000 FM	1
			Pump	1,247	43		
			Contingency	845	-		
			Total	3,660	51		
C5	Conveyance from T. P. Smith Plant to T. P. Smith Disposal Site	5.0	Sewer	--	-	0	1
			Pump	1,247	23		
			Contingency	374	-		
			Total	1,621	23		

TABLE 2-7 (Cont'd.)

ALTERNATIVE WASTEWATER CONVEYANCE COMPONENTS[3]

			Costs (Thousand $)				
ID	Description	Design Flow (mgd)	Item	Capital[1]	Annual O&M	Length of Pipe (feet)[2]	Number of Pump Stations
C6	Conveyance from NE Plant to NE Disposal Site	5.2	Sewer	--	-	0	1
			Pump	1,296	39		
			Contingency	389	-		
			Total	1,685	39		
C7	Conveyance from NE Plant to T. P. Smith Disposal Site	5.2	Sewer	7,945	39	82,800 FM	1
			Pump	1,296	65		
			Contingency	2,772	-		
			Total	12,013	104		
C8	Conveyance from NE Plant to SE Disposal Site	5.2	Sewer	6,400	32	66,700 FM	1
			Pump	1,297	64		
			Contingency	2,309	-		
			Total	10,006	96		
C9	Conveyance from NE Plant to Forest Service Land Near Airport	5.2	Sewer	9,576	48	99,800 FM	1
			Pump	1,296	66		
			Contingency	3,261	-		
			Total	14,133	114		
C10	Conveyance from T. P. Smith Plant to Golf Courses	3.0	Sewer	1,396	7	38,000 FM	1
			Pump	1,538	51		
			Contingency	880	-		
			Total	3,814	58		
C11	Conveyance from Lake Bradford Road Plant to Golf Courses	3.0	Sewer	1,321	6	36,200 FM	1
			Pump	1,538	50		
			Contingency	858	-		
			Total	3,717	56		
C12	Conveyance from NE Plant to Golf Courses and Country Club	0.5	Sewer	246	1	20,000 FM	1
			Pump	256	12		
			Contingency	151	-		
			Total	653	13		
C13	Conveyance from T. P. Smith Plant to Power Plant	3.0	Sewer	2,204	11	44,800 FM	1
			Pump	1,538	41		
			Contingency	1,122	-		
			Total	4,864	52		
C14	Conveyance from NE Plant to Golf Course, Country Club, and ABM State Gardens	1.0	Sewer	554	3	10,000 FM	1
			Pump	513	23		
			Contingency	320	-		
			Total	1,387	26		

TABLE 2-7 (Cont'd.)

ALTERNATIVE WASTEWATER CONVEYANCE COMPONENTS(3)

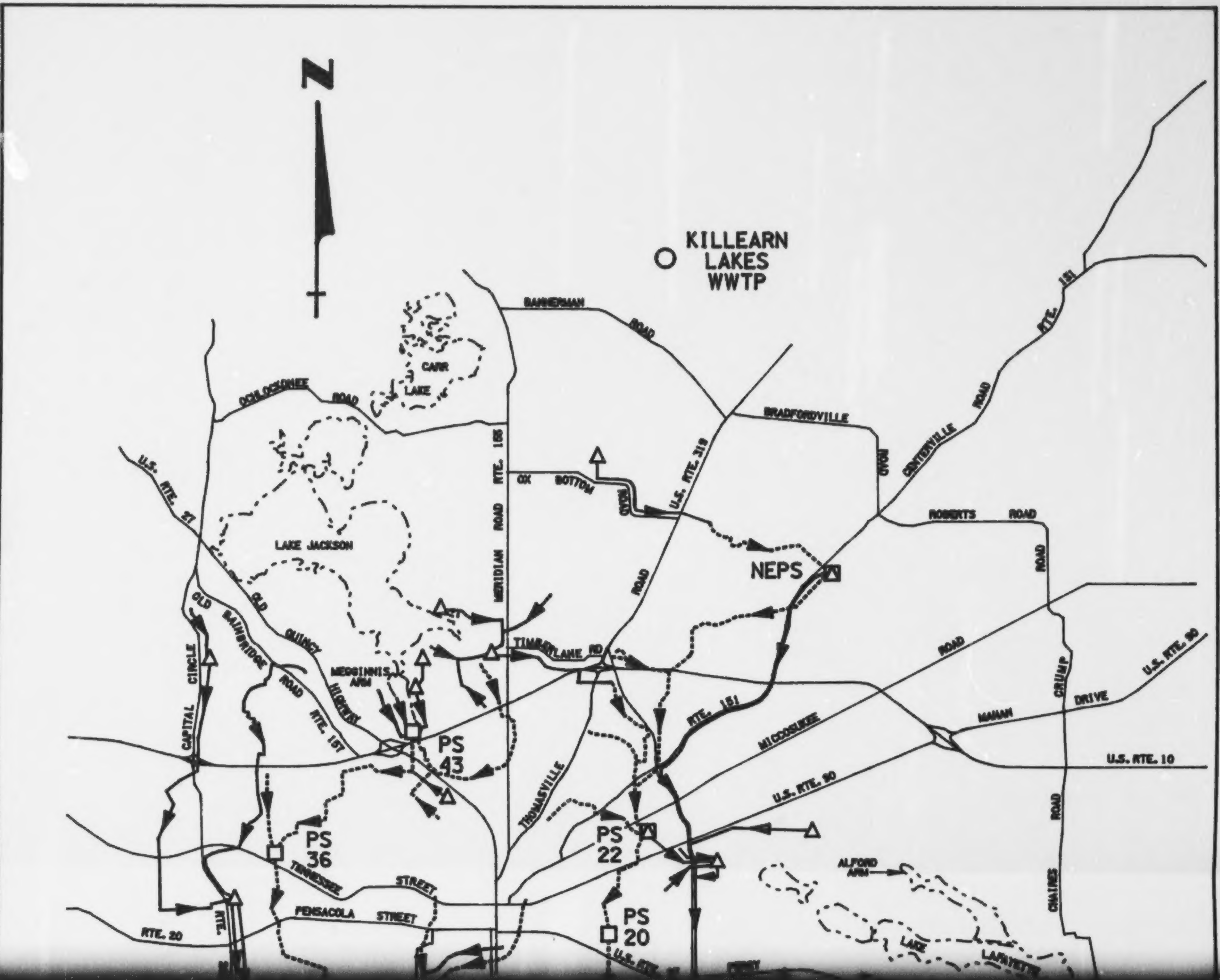
			Costs (Thousand $)				
ID	Description	Design Flow (mgd)	Item	Capital(1)	Annual O&M	Length of Pipe (feet)(2)	Number of Pump Stations
C15	Conveyance from T. P. Smith to Powr Line Right-of-Way Areas	1.0	Sewer	3,382	17	154,500 FM	1
			Pump	1,025	74		
			Contingency	1,322	-		
			Total	5,729	91		
C16	Conveyance from T. P. Smith to Existing Sludge Disposal Fields	3.9	Sewer	1,107	5	20,000 FM	1
			Pump	1,999	31		
			Contingency	932	-		
			Total	4,038	36		
C17	Conveyance from T. P. Smith to Rapid Infiltration Basins at SE Site			(Same as C3)			
C18	Conveyance from T. P. Smith to Irrigation Site(s) and Percolation Ponds	1.5	Sewer	2,043	10	79,100 FM	1
			Pump	769	109		
			Contingency	844	-		
			Total	3,656	119		
C19	Treatment Decentralized (Conveyance System for Area Systems)	0.25	Total	1,008(4)	9	11,000 FM	1 PS/ Area System

(1) Includes contingency costs at 30% of construction costs (15% for engineering, 10% for legal and administrative costs, and 5% for interest during construction).

(2) FM = Force Main
GS = Gravity Sewer

(3) Third quarter 1989 dollars.

(4) Based on 530 connections.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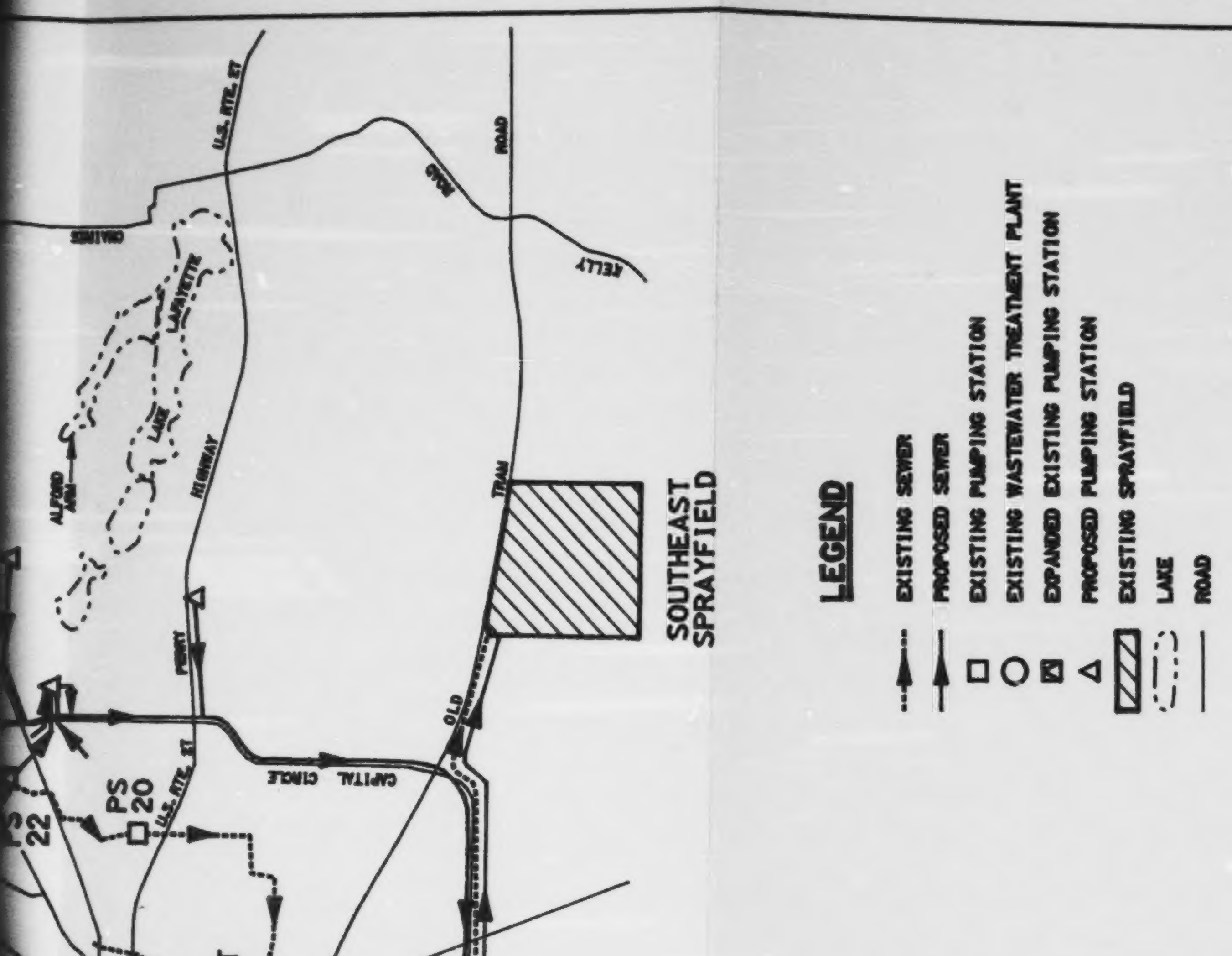
KILLEARN LAKES WWTP
NEPS
PS 43
PS 36
PS 22
PS 20
BANNERMAN ROAD
BRADFORDVILLE ROAD
CENTERVILLE ROAD
RTE. 151
ROBERTS ROAD
CRUMP ROAD
CHAIRES ROAD
MAHAN DRIVE
U.S. RTE. 90
U.S. RTE. 10
MICCOSUKEE ROAD
U.S. RTE. 319
OX BOTTOM ROAD
MERIDIAN ROAD RTE. 155
TIMBERLANE RD
THOMASVILLE
OCHLOCKONEE ROAD
CARR LAKE
LAKE JACKSON
MEGGINNIS ARM
U.S. RTE. 27
OLD QUINCY HIGHWAY
OLD BAINBRIDGE ROAD RTE. 157
CAPITAL CIRCLE
TENNESSEE STREET
PENSACOLA STREET
RTE. 20
RTE.
ALFORD ARM
LAKE LAFAYETTE

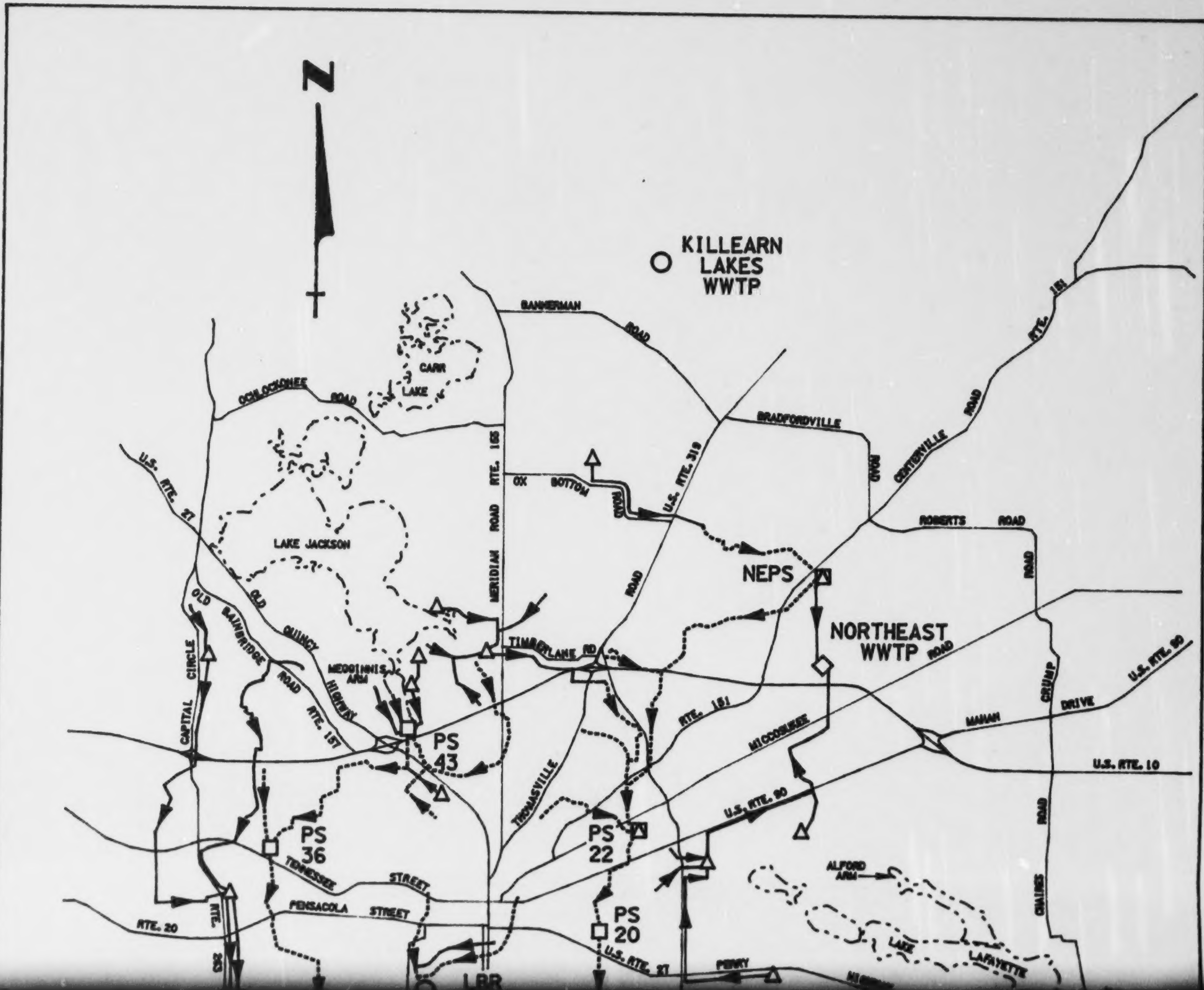

U.S. RTE. 27
ROAD
KELLY ROAD
CHAIRES
LAFAYETTE
LAKE
ALFORD ARM
HIGHWAY
PERRY
TRAM
OLD
SOUTHEAST SPRAYFIELD
CAPITAL CIRCLE
PS 22
PS 20
U.S. RTE. 27
LBR PLANT
SRPS
PS 36
TENNESSEE STREET
PENSACOLA STREET
PS 12
CIRCLE
LAKE MUNSON
SOUTHWEST SPRAYFIELD
CAPITAL
RTE. 263
RTE. 20
MAP PLANT
TPS PLANT
LEGEND
EXISTING SEWER
PROPOSED SEWER
EXISTING PUMPING STATION
EXISTING WASTEWATER TREATMENT PLANT
EXPANDED EXISTING PUMPING STATION
PROPOSED PUMPING STATION
EXISTING SPRAYFIELD
LAKE
ROAD
0
10000
20000
30000
SCALE IN FEET

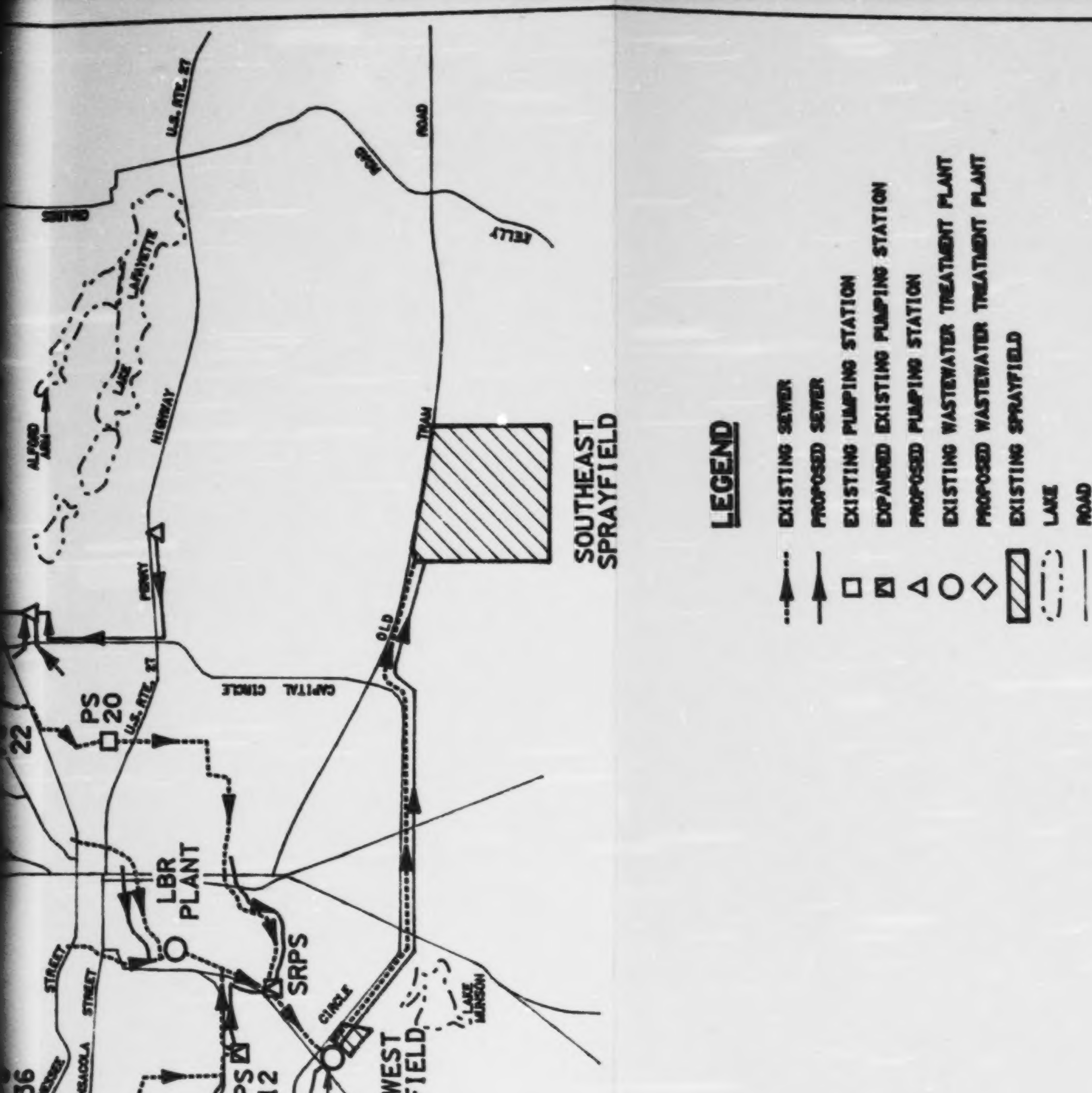
TALLAHASSEE - LEON COUNTY
ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

PROPOSED CONVEYANCE SYSTEM TREATMENT SOUTH

GANNETT FLEMING ENVIRONMENTAL ENGINEERS, INC.

FIGURE 2-2


N
KILLEARN LAKES WWTP
BANNERMAN ROAD
BRADFORDVILLE ROAD
CENTERVILLE ROAD
RTE. 151
ROBERTS ROAD
OCHLOCKONEE ROAD
CARR LAKE
LAKE JACKSON
U.S. RTE. 27
MERIDIAN ROAD RTE. 155
OX BOTTOM ROAD
U.S. RTE. 319
NEPS
NORTHEAST WWTP
ROAD
TIMBERLANE RD
OLD BAINBRIDGE ROAD
OLD QUINCY HIGHWAY
CAPITAL CIRCLE
MEGGINNIS ARM
RTE. 157
PS 43
RTE. 151
MICCOSUKEE
MAHAN DRIVE
U.S. RTE. 90
U.S. RTE. 10
CRUMP ROAD
CHAIRES ROAD
THOMASVILLE
PS 36
PS 22
TENNESSEE STREET
PENSACOLA STREET
RTE. 20
RTE. 263
U.S. RTE. 90
PS 20
U.S. RTE. 27
PERRY
ALFORD ARM
LAKE LAFAYETTE
LBR


LEGEND
EXISTING SEWER
PROPOSED SEWER
EXISTING PUMPING STATION
EXPANDED EXISTING PUMPING STATION
PROPOSED PUMPING STATION
EXISTING WASTEWATER TREATMENT PLANT
PROPOSED WASTEWATER TREATMENT PLANT
EXISTING SPRAYFIELD
LAKE
ROAD
SOUTHEAST SPRAYFIELD
SOUTHWEST SPRAYFIELD
LBR PLANT
SRPS
PS 20
PS 12
22
36
MAP PLANT
TPS PLANT
LAKE MUNSON
U.S. RTE. 27
PERRY HIGHWAY
CAPITAL CIRCLE
OLD TRAM ROAD
WOODVILLE
RTE. 20
RTE. 263
TENNESSEE STREET
PENSACOLA STREET
ALFORD ARM
LAKE LAFAYETTE
KELLY

TALLAHASSEE - LEON COUNTY
ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

PROPOSED CONVEYANCE SYSTEM TREATMENT NORTH AND SOUTH

0
10000
20000
30000
SCALE IN FEET

GANNETT FLEMING ENVIRONMENTAL ENGINEERS, INC.

FIGURE 2-3

solids (TSS). Additionally, effluent used to irrigate public access areas, such as golf courses, must first receive filtration to reduce TSS, and high level disinfection. The percolated effluent must not add contaminants to the groundwater aquifer in concentrations that violate safe drinking water standards. Therefore, the effluent disposal method used may require that additional advanced wastewater treatment be employed to remove pollutants such as nitrogen, phosphorus, chemical oxygen demand (COD), heavy metals, or toxic compounds (BOD) and total suspended solids (TSS).

The wastewater treatment alternative components presented here either meet the secondary level of treatment for existing facilities or will be designed to meet the secondary level of treatment in the case of new or expanded facilities. Also, facilities must be capable of handling the peak daily flows generated by the appropriate service areas. Table 2-8 summarizes the alternative wastewater treatment components. Note that treatment components for improving and expanding the TPS Plant (T2) and for con- structing a new NE Plant (T3) include the option of having phosphorus removal capabilities. This was done to provide for the use of artificial wetlands and power plant cooling as effluent disposal components, which require additional phosphorus removal to meet effluent regulations. Figure 2-4 illustrates the locations of the proposed and expanded treatment facilities. Appendix B describes in more detail, the elements of the treatment alternative components.

The SE Plant proposed in the 1983 EIS was not included in the alternative development process as an option to the NE Plant because it was determined that "good engineering practice" requires treatment of wastewaters as close to the source as possible, in this case the Northeast service area. The use of long interceptors for transporting untreated sewage creates anaerobic conditions in the pipelines. This leads to undesirable biological transformations, especially the generation of hydrogen sulfide. These transformations cause problems such as the corrosion of sewers and other facilities and the need for control of odorous/toxic gases in sewers. The treatability of the wastewater is also reduced because of the significant increase in the immediate oxygen demand of the wastewater arriving at the plant, and the significant growth of filamentous microorganisms (from slime layer accumulation) that affect the operations of a treatment process. All these problems increase both the capital and annual operation and maintenance costs for a facility and are difficult to quantify in the planning process. It should be noted that the treatability of wastewater may be an issue for the alternative component involving an expanded TPS Plant to accept flows from the northeast. It is assumed that the additional costs to overcome any problems that may occur are offset by the lower costs for expanding an existing treatment plant versus the higher costs for siting, constructing, and operating a separate new plant.

The 0.25 mgd expansion of the existing Killearn Lakes Plant is currently underway. No consideration was given to the possibility of expanding this facility beyond that capacity, in that a larger expansion would be similar to the alternative for the construction of the proposed NE Plant.

TABLE 2-8

ALTERNATIVE WASTEWATER TREATMENT COMPONENTS

ID	Description	Design Flow (mgd)	Costs (Thousand $) Item	Capital(1)	Annual O&M	Design Characteristics
T1	Lake Bradford Road Plant Improvement	4.5	Treatment	587	94	o Influent/effluent pump rates = 6.75 mgd
			Conting.	176	-	
			Total	763	94	o Add flow equalization tank and sludge thickener o Modify influent division structure, bar screen and grit chamber, and sewer division headquarters
T2	T. P. Smith Plant Improvement and Expansion from 20.0 mgd		Without P Removal:			o Increase master pump station rate to equal a peak flow rate
		21.3	Treatment	2,246	332	
			Conting.	337	-	
			Total	2,583	332	o Add primary clarifiers, aeration tanks, secondary clarifiers, a return sludge, pump station, an aerobic digester, a bar screen, a preliminary treatment dewatering unit and dual conveyor belts, flow equalization tanks, pump station and underdrains for raw sewage overflow
		27.5	Treatment	12,959	1,916	
			Conting.	1,943	-	
			Total	14,902	1,916	
			With P Removal:			
	Additional cost for Phosphorus Removal(2)	3.8	Treatment	707	122	
			Conting.	212	-	
			Total	919	122	
		6.0	Treatment	1,023	193	o Modify grit chambers, Parshall flume and chlorine contact chamber
			Conting.	307	-	
			Total	1,330	193	o Optional phosphorus removal unit (alum addition)
		9.0	Treatment	1,301	290	
			Conting.	390	-	o Doesn't include disposal costs of extra sludge generated by phosphorus removal
			Total	1,691	290	
T3	Northeast Plant Construction		Without P Removal:			
		5.2	Land	143	-	o Secondary treatment level with activated sludge wastewater treatment, chlorination, flotation sludge thickening, anaerobic sludge digestion, and mechanical sludge dewatering
			Treatment	16,309	453	
			Conting.	4,893	-	
			Total	21,345	453	
	Additional cost for Phosphorus Removal(2)	5.2	With P Removal:			
			Treatment	505	97	
			Conting.	151	-	o Optimal phosphorus removal unit (biological A/O unit)
			Total	656	97	

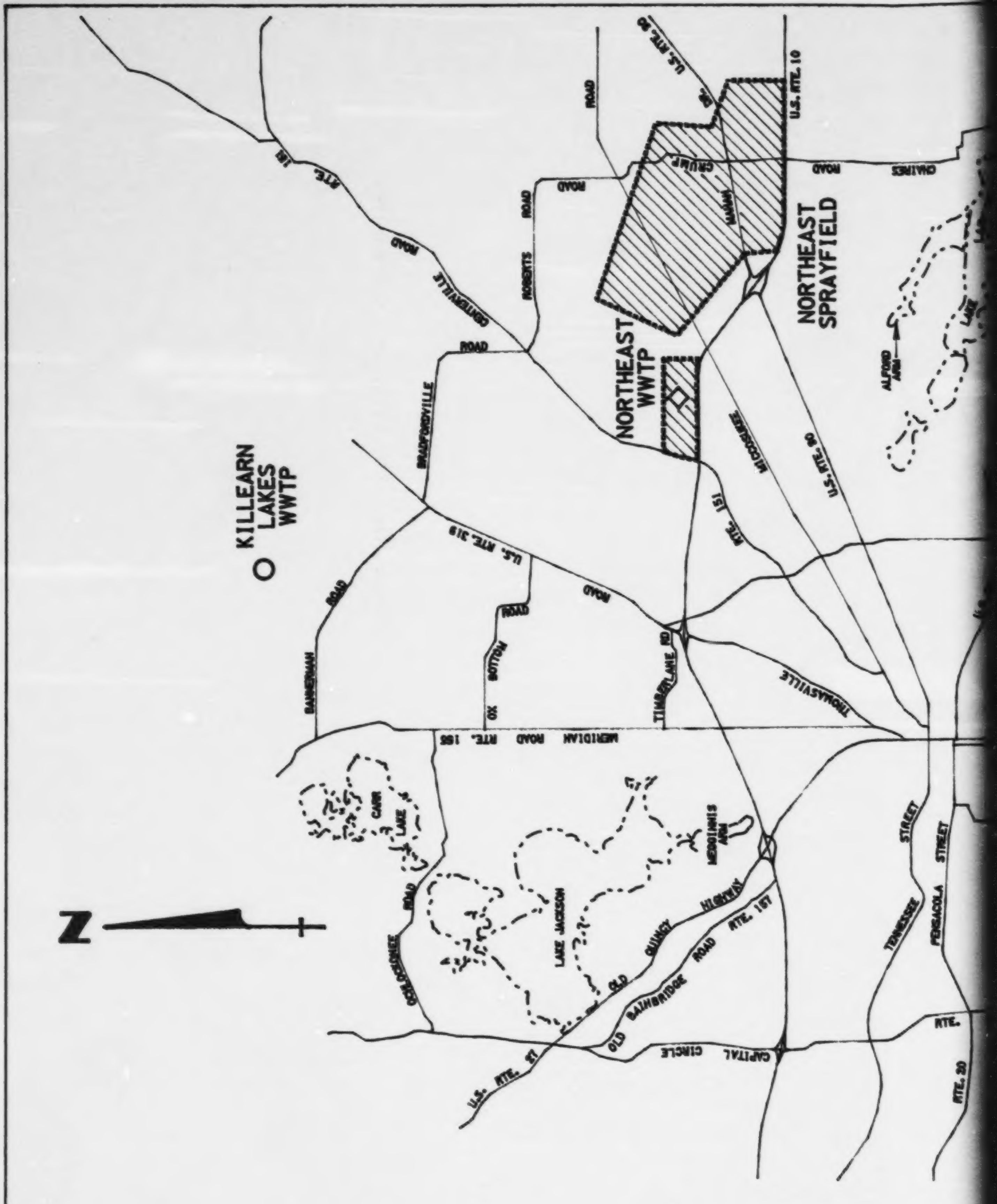
TABLE 2-8 (Cont'd.)

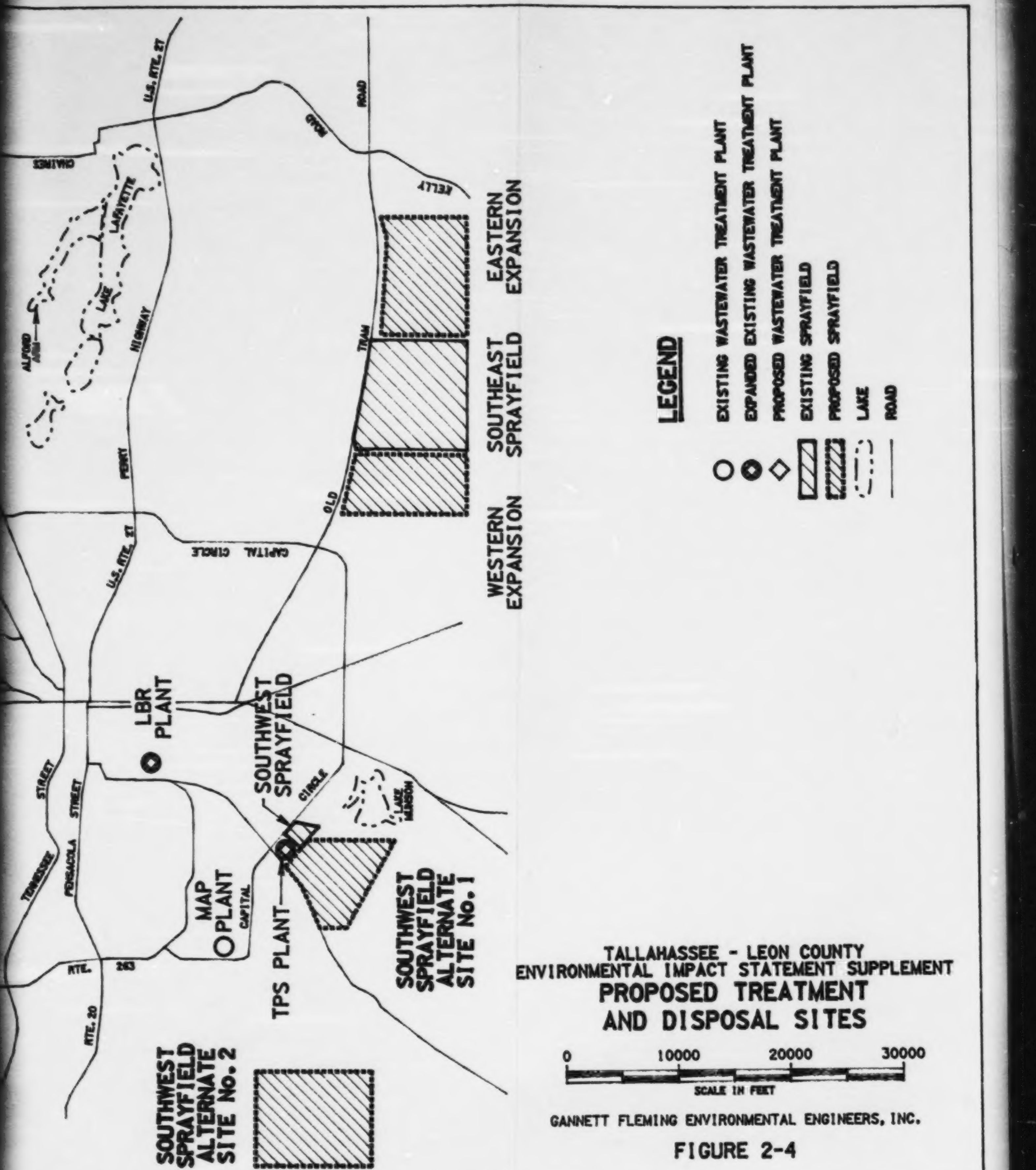
ALTERNATIVE WASTEWATER TREATMENT COMPONENTS

ID	Description	Design Flow (mgd)	Costs (Thousand $)			Design Characteristics
			Item	Capital(1)	Annual O&M	
T4	On-lot Systems (includes disposal)	6.25	Septic Tank and Soil Absorption	25,793	142	o 3.125 mgd handled by septic tanks with soil absorption fields (typical unit has a 1,000 gal. septic tank and 750 sf field with a 30 min./in. percolation rate)
			Septic Tank and Sand Mound	67,505	779	
			Total	93,298	921	o 3.125 mgd handled by septic tanks with sand mounds (typical unit has a 1,000 gal. septic tank, a mound height between 3.5 and 5 feet, and a centrifugal pump with a rate of 30 gal./min)
T5	Area Systems	0.25	Killearn Lake Plant Expansion	1,130	145	o Contact stabilization treatment with land application disposal

(1) Contin. = Contingency costs assumed to be 30% of construction costs (15% for engineering, 10% for legal and administrative costs, and 5% for interest during construction). Component T2 excludes the engineering contingency costs because the design stage is completed.

(2) Additional phosphorus removal is required for effluent disposal options D5 (Power Plant Cooling) and D16/D17 (Artificial Wetlands).


KILLEARN LAKES WWTP
NORTHEAST WWTP
NORTHEAST SPRAYFIELD
N
RTE. 151
CENTERVILLE ROAD
ROBERTS ROAD
ROAD
BRADFORDVILLE ROAD
U.S. RTE. 319
BANNERMAN ROAD
OX BOTTOM ROAD
ROAD
TIMBERLANE RD
THOMASVILLE
MERIDIAN ROAD RTE. 155
CARR LAKE
OCHLOCKONEE ROAD
LAKE JACKSON
MEGGINNIS ARM
OLD QUINCY HIGHWAY
OLD BAINBRIDGE ROAD RTE. 157
U.S. RTE. 27
CAPITAL CIRCLE
TENNESSEE STREET
PENSACOLA STREET
RTE.
RTE. 20
ROAD
U.S. RTE. 90
U.S. RTE. 10
CRUMP
MAHAN
ROAD
CHAIRES
MICCOSUKEE
RTE. 151
U.S. RTE. 90
ALFORD ARM
LAKE


LEGEND
○ EXISTING WASTEWATER TREATMENT PLANT
⊗ EXPANDED EXISTING WASTEWATER TREATMENT PLANT
◇ PROPOSED WASTEWATER TREATMENT PLANT
▨ EXISTING SPRAYFIELD
▨ PROPOSED SPRAYFIELD
LAKE
ROAD
SOUTHWEST SPRAYFIELD ALTERNATE SITE No. 2
SOUTHWEST SPRAYFIELD ALTERNATE SITE No. 1
TPS PLANT
MAP PLANT
LBR PLANT
SOUTHWEST SPRAYFIELD
WESTERN EXPANSION
SOUTHEAST SPRAYFIELD
EASTERN EXPANSION
TENNESSEE STREET
PENSACOLA STREET
CAPITAL CIRCLE
RTE. 263
RTE. 20
U.S. RTE. 27
PERRY HIGHWAY
OLD TRAM ROAD
KELLY ROAD
CHAIRES
LAKE LAFAYETTE
ALFORD ARM
LAKE MUNSON
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20000
30000
SCALE IN FEET

TALLAHASSEE - LEON COUNTY
ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT
PROPOSED TREATMENT
AND DISPOSAL SITES

GANNETT FLEMING ENVIRONMENTAL ENGINEERS, INC.

FIGURE 2-4

2.3.3 Alternative Wastewater Disposal Facilities

Table 2-9 summarizes the alternative disposal components. The applicability of these disposal components is related to corresponding treatment components. It should be noted that for disposal components using the SE disposal site (D1, D2, D11, and D16), land costs are incorporated into the O&M costs. Currently the City has a lease agreement with the St. Joseph Land and Development Company, the owners of the SE land. The agreement sets a lease rate for the land based on the market value price of 2 cords of pulpwood per acre per year. A similar type of agreement is expected to be used for any additional lands.

As stated in the County MW&SSP, the US EPA agreed to amend the scope of the EIS Supplement from that of the originally authored document to include additional lands presently under consideration by the City of Tallahassee for an expansion of its effluent spray disposal facilities. These lands are situated in the Apalachicola National Forest, and are owned by the USDA Forest Service (FS).

The City approached the USDA FS with a proposal for a land exchange in order to obtain the subject lands for this purpose. The USDA FS did not commit to the proposed trade, but expressed that they would require an EIS be prepared to address the issues surrounding the action prior to any consideration of such an exchange. After the August 15, 1989 Public Workshop concerning the EIS Supplement, USDA FS forest lands were removed from further consideration as locations for effluent disposal by EPA, though EPA does support the use of effluent irrigation for biomass production in appropriate sites. The public and the Florida Game and Fresh Water Fish Commission (FG&FWFC) expressed concern over losing valuable longleaf pine-wiregrass habitat found in these forested areas and the restriction of public access to these areas for recreation. The primary issue in question is the available longleaf pine-wiregreass habitat, not the existing vegetation. The FG&FWFC recommends that such habitat in Florida is critical to maintain and should also be restored to the fullest extent possible. As such, this is a perfect site for the reintroduction of longleaf pine and the cutting of the present slash pine. Figure 2-4 illustrates the locations of the proposed disposal facilities including proposed USDA FS disposal facilities. Appendix C describes in detail each of the alternative components.

2.3.4 Alternative Sludge Treatment and Disposal Facilities

Table 2-10 summarizes the alternative sludge handling components. Appendix D describes each of the components in more detail.

2.3.5 Alternative Decentralized Wastewater Management Facilities

2.3.5.1 On-lot Systems

On-lot wastewater treatment systems in Tallahassee are generally limited to septic tanks, although sand filters and extended aeration systems have also been used (US EPA, 1981). On-lot systems are mostly associated with individual residents, although some institutions and commercial facilities also use the systems. Subsequently, the on-lot component assumes the use of septic tanks for residential lots.

TABLE 2-9

ALTERNATIVE WASTEWATER DISPOSAL COMPONENTS

			Costs (Thousand $)			
ID	Description	Design Flow (mgd)	Item	Capital(1)	Annual O&M	Design Characteristics
D1	Southeast Agricultural Spray Irrigation	2.5 (469 acres)	Land	-	22	o Application rates of 2 in/wk o Storage facility for a maximum of 7 days of flow o Crop rotation management similar to existing system o O&M costs include land lease costs
			Facilities	1,468	327	
			Conting.	440	-	
			Total	1,908	349	
		3.8 (712 acres)	Land	-	33	
			Facilities	2,231	497	
			Conting.	669	-	
			Total	2,900	530	
		7.5 (1,410 acres)	Land	-	65	
			Facilities	4,403	980	
			Conting.	1,321	-	
			Total	5,724	1,045	
D2	Northeast Agricultural Spray Irrigation	5.2 (2,235 acres)	Land	22,350	-	o Application rate of 0.75 in/wk o Storage facility for a maximum of 7 days of flow o Crop rotation management similar to existing system at SE sprayfield o Capital costs include land purchase costs
			Facilities	7,195	669	
			Conting.	2,159	-	
			Total	31,704	669	
D3	Southeast Forest Spray Irrigation	3.8 (747 acres)	Land	-	34	o Buried, solid-set sprinklers with 60'x80' sprinkler and pipe spacing (approx. 9 sprinklers/acre) and operating pressures between 55 and 70 psi o Application rates of 2 in/wk for mature growth and 1.5 in/wk for growth 2 years and under o Tree species include slash pine, loblolly pine and pond (swamp) pine o "Whole tree" harvesting every 10 years o Storage facility for a maximum of 7 days of flow o O&M costs include land lease cost
			Facilities	4,848	167	
			Conting.	1,454	-	
			Total	6,303	201	
		7.5 (1,475 acres)	Land	-	68	
			Facilities	9,428	316	
			Conting.	2,828	-	
			Total	12,256	384	

TABLE 2-9 (Cont'd.)

ALTERNATIVE WASTEWATER DISPOSAL COMPONENTS

			Costs (thousand $)			
ID	Description	Design Flow (mgd)	Item	Capital$^{(1)}$	Annual O&M	Design Characteristics
D4	Northeast Forest Spray Irrigation	5.2 (2,725 acres)	Land	27,250	-	o Same as Alternative Component D3 except application rates are 0.75 in/wk for mature growth and 0.40 in/wk for growth 2 years and under o Capital costs include land purchase costs
			Facilities	14,111	560	
			Conting.	4,233	-	
			Total	45,594	560	
D5	Power Plant Cooling at A. B. Hopkins Generating Station	3.0	Facilities	4,270	265	o T. P. Smith Facility to be upgraded to include filtration and high-level disinfection o Storage facility for 3 mg o Blowdown of 1.0 mgd would require a discharge permit to discharge into a tributary of Lake Talquin.
			Conting.	1,281	-	
			Total	5,551	265	
D6	Golf Course Irrigation o FL State University o Jake Gaither o Capital City Country Club o Hilaman Municipal	3.0	Facilities	2,307	78	o Use existing golf course ponds for flow storage o Use existing irrigation systems for distribution o Treatment Facility to be upgraded to include filtration and high-level disinfection
			Conting.	691	-	
			Total	2,998	78	
D7	Golf Course Irrigation at Killearn Golf Course and Country Club	0.5	Facilities	390	23	o Same as Alternative Component D6
			Conting.	117	-	
			Total	507	23	
D8	Golf Course Irrigation at Killearn Golf Course and Country Club and at Alfred B. Maclay State Gardens	1.0	Facilities	871	44	o Same as Alternative Component D6 o Storage facility for 0.5 mg needed at the State Gardens o Evaluation of State Gardens' plant species needed to determine acceptable irrigation areas
			Conting.	261	-	
			Total	1,132	44	

TABLE 2-9 (Cont'd.)

ALTERNATIVE WASTEWATER DISPOSAL COMPONENTS

			Costs (thousand $)			
ID	Description	Design Flow (mgd)	Item	Capital(1)	Annual O&M	Design Characteristics
D9	Power Line Right-of-Way Areas	2.0	Facilities	3,460	111	o T. P. Smith Facility to be upgraded to include filtration and high-level disinfection o Application rate of 2.0 in/wk o Right-of-way areas to have an average width of 100 feet therefore 26.67 miles of right-of-way are required o Buried, solid set sprinklers o No storage facility
			Conting.	1,038	-	
			Total	4,498	111	
D10	Existing Sludge Disposal Fields	3.9	Facilities	523	72	o Application rate of 2.0 in/wk o Center pivot sprinklers o No storage facility o Evaluation to determine possible adverse effects of spray irrigation on airport activities
			Conting.	157	-	
			Total	680	72	
D11	Rapid Infiltration Basins at SE Site	3.8	Land	-	9	o May require treatment for additional nitrogen removal to prevent groundwater contamination o Application rate of 10 in/wk o No storage facility o RIB's to be constructed as small, one-acre cells o Extensive groundwater monitoring required o Evaluation of sinkhole activity to prevent "short circuiting" of the infiltration system o O&M costs include land lease costs
		(190 acres)	Facilities	3,725	347	
			Conting.	1,117	-	
			Total	4,842	356	
		6.0	Land	-	14	
		(300 acres)	Facilities	5,882	547	
			Conting.	1,764	-	
			Total	7,646	561	
		9.0	Land	-	21	
		(450 acres)	Facilities	8,822	801	
			Conting.	2,646	-	
			Total	11,468	822	

TABLE 2-9 (Cont'd.)

ALTERNATIVE WASTEWATER DISPOSAL COMPONENTS

			Costs (thousand $)			
ID	Description	Design Flow (mgd)	Item	Capital$^{(1)}$	Annual O&M	Design Characteristics
D12	Rapid Infiltration Basins at NE Site	5.2 (260 acres)	Land	2,600	-	o Same as Alternative Component D11 except that land is purchased not leased o Capital costs include land purchase costs
			Facilities	5,097	474	
			Conting.	1,529	-	
			Total	9,226	474	
D13	Landscape Irrigation and Disposal in Percolation Ponds (redistribution)	1.5	Facilities	1,461	65	
			Conting.	439	-	
			Total	1,900	65	
D14	Surface Waters St. Mark's River (pipe length = 15 mile)	5.0	Convey.	9,870	55	o St. Mark's River has been classified by FDER as a Special Waters (0 effluent limitation)
			Conting.	2,961	-	
			Total	12,831	55	
	Ochlockonee River (pipe length = 9.8 mile)	5.0	Convey.	7,323	112	o Ochlockonee River has been classified by FDER as a Special Waters (0 effluent limitation)
			Conting.	2,197	-	
			Total	9,520	112	
	Ocean Outfall (Gulf of Mexico, pipe length = 22.4 miles)	5.0	Convey.	16,707	90	o Outfall consists of a 1 mile long, buried pipe
			Conting.	5,012	-	
			Total	21,719	90	
D15	Deep Well Injection	5.0	Test Prog.	767	-	o Install a test well to identify a geologic formation suitable for injection o Costs assume a well depth of 4,000 feet and an injection pressure of 75 psi
			Pump	1,247	129	
			Wells	1,610	60	
			Conting.	1,087	-	
			Total	4,711	189	

TABLE 2-9 (Cont'd.)

ALTERNATIVE WASTEWATER DISPOSAL COMPONENTS

			Costs (thousand $)			
ID	Description	Design Flow (mgd)	Item	Capital(1)	Annual O&M	Design Characteristics
D16	Artificial Wetlands at SE Disposal Site	3.8 (234 acres)	Land	-	11	o Subsurface flow systems o Pilot program to be developed prior to full-scale construction to determine pollutant removal efficiencies o Detention time = 14 days o Maximum loading rate = 6 acre-in/wk o Maximum nutrient loading rate = 75 g/m^2/yr total nitrogen o Maximum effluent content from wetlands = 5 mg/l BOD; 5 mg/l TSS; 3 mg/l Total N; and 1 mg/l Total P o Fill is a 30 inch deep gravelly sand mixture (maximum 10% diameter 8 mm) that is planted with bulrushes o Media is lined with an artificial or compacted clay liner with a permeability = 1x10^{-6} meters/sec o Slope of system = 1.5% o Integrated discharge system with RIB's o O&M costs include land lease costs
			Facility	4,653	51	
			Conting.	1,396	-	
			Total	6,049	62	
		6.0 (370 acres)	Land	-	17	
			Facility	7,285	75	
			Conting.	2,186	-	
			Total	9,471	92	
		9.0 (554 acres)	Land	-	26	
			Facility	10,774	97	
			Conting.	3,232	-	
			Total	14,006	123	
D17	Artificial Wetlands at NE Disposal Site	5.2 (320 acres)	Land	3,200	-	o Same as Alternative Component D16 except that land is purchased not leased o Capital costs include land purchase costs
			Facility	6,355	69	
			Conting.	1,907	-	
			Total	11,462	69	

(1) Conting. = Contingency costs assumed to be 30% of construction costs (15% for engineering, 10% for legal and administrative costs, and 5% for interest during construction)

TABLE 2-10

ALTERNATIVE SLUDGE TREATMENT/DISPOSAL COMPONENTS

ID	Description	Design Capacity (Dry Tons/mgd)	Cost (Thousand $) Capital	Cost (Thousand $) Annual O&M
SD1	Land Spreading	0.36		
	Treatment South			
	Sludge Hauling		269	252
	Sludge Disposal		1,196	164
	Total		1,465	416
	Treatment North and South			
	Sludge Hauling		134	199
	Sludge Disposal		2,548	209
	Total		2,682	408
SD2	Pelletization	0.36	10,251	2,435

Septic tanks alone do not meet secondary treatment levels; they rely on the biological activity in the soil absorption drainfield to complete the secondary level treatment. Additional treatment takes place as the effluent percolates through the soil. Septic tank with effluent field systems can operate effectively with limited maintenance as long as soil conditions, land slopes and land use are suitable.

Slopes are normally not a critical limitation to the siting of drainfields due to the low topographic relief in the study area, but slopes are locally limiting in situations of steep slopes on the edge of incised streams. Site-specific soil conditions and adjacent land use can severely influence drainfield placement in the County.

The Soil Survey of Leon County, Florida, February 1981 (prepared as a cooperative venture between USDA SCS and the University of Florida) developed a rating system to identify areas by their limitations for use in septic tank drainfield applications. The ratings (slight, moderate, and severe limitations) were based on soil properties, site features, and observed performance of the soils. According to the County MW&SSP, a map presented in the survey indicates that an immense area of lands situated in the extreme southeast and southwestern areas of the County are not suited for development using septic tanks. Also, aside from a sweeping band of soils crossing the south-center of the County which are ideally suited for septic tanks, the County is covered largely by widely interspersed soils of all three limitation types. However, the predominance of "moderate" soil limitations in the northeast indicates that this area of the County can physically accommodate a considerable amount of strategically located future development with septic tanks in support of either low density residential developments, or small commercial and industrial-type developments.

From discussion with the USDA SCS and the LCPH, it is evident that use of the soils in the northeast area for septic tank effluent drain- fields is somewhat limited. USDA SCS and LCPH employees involved with per- mitting on-lot systems indicated that, as house densities increase on areas of marginal soils, the incidence of drainfield failures increase. In particular, USDA SCS and LCPH employees feel the problems experienced in the Killearn Lakes Subdivision are intensified due to the small (1/4 acre) lot size and the semi-controlled sheet flow for stormwater management.

The predominant soil type, which experiences septic tank operation problems, is the Dothan soil series. The USDA SCS description of this soil indicates a perched water table at 3-1/2 to 4 feet during portions of the year. The experience in Killearn Lakes is that the water table is at 2 inches above ground to 12 inches below ground for extended periods of time. The USDA SCS and LCPH personnel believe that the septic tank failures are due to the elevated groundwater table brought on by water added to the soil profile through the on-lot systems effluent drainfields and by small lots with closely spaced drainfields. The problem is exacerbated by the directed sheet flow over numerous lots in the area.

Drainfield failures on lots on Dothan soils occur in other areas within the County; however, the failure rate in other portions of the County is low in comparison to the Killearn Lakes failure rates. This is primarily due to localized natural variations in the soil and larger lot sizes in other subdivisions.

To overcome less than ideal conditions, various processes have been developed that enhance the treatment and disposal capabilities of on-lot systems. Sand mound disposal systems are utilized in some soils that are not suitable for conventional soil drainfields. Rather than a five- to six-foot depth to water table required for soil percolation, only a three-foot depth to water table is normally required with sand mounds. The mound itself provides an unsaturated soil depth for additional treatment with increased wastewater retention capacity which results in higher treatment efficiency.

Mound systems are being used in isolated instances within the Killearn Lakes Subdivision with varying degrees of success. Some of the problems associated with these individual systems are that the grade of the house and septic tank results in little area on the lots being available for the mound without the need for pumping, and when the groundwater level is very shallow the water moving through the mound moves laterally out of the mound resulting in surface ponding or flow over the developed lot.

Evapotranspiration beds allow wastewater to be utilized by plants and evaporated into the atmosphere. These beds can be used only where evaporation and transpiration exceeds precipitation. Within Leon County, climate conditions prevent the use of evapotranspiration beds during the wettest months of the year because rainfall exceeds evaporation by more than 2 inches per month.

Component T4 uses a combination of conventional soil absorption fields and innovative sand mounds for costing purposes. Costs for this component are presented in Table 2-8.

2.3.5.2 Area Systems

The area system treatment component will have to meet the same secondary treatment levels and required advanced wastewater treatment as the larger conventional facilities. The area system disposal components include evaporation-percolation ponds and irrigation systems as well as soil absorption drainfields and sand mound systems. Both ponds and irrigation systems become more competitive as larger flows are handled. Land requirements for each type of system are variable depending on soil percolation rates, evapotranspiration, and treatment system buffer requirements established by state and local agencies.

These systems will most likely be located in the outer fringe of the City's existing service areas and elsewhere in the unsewered areas of the County. It is also possible that existing developments with failing on-lot systems could be retrofitted with area systems as opposed to connection with the existing conventional system. The actual size and location of these systems would vary on a case-by-case basis. For this report the component, T5, only includes the costs for the proposed TECO facility at Killearn Lakes. Costs for this component are presented in Table 2-8.

2.3.6 Management Options

Management as used here refers to owning, planning, constructing, operating, and/or maintaining of wastewater service facilities. Development of management options requires a review of the management of existing wastewater services as was done in Section 2.1.

The entities identified as currently managing major wastewater facilities include the City and TECO. Other small private providers exist but are not considered capable of managing the level of services needed in the future and therefore are not identified here. It is realized, however, that a limited amount of services will be provided by such companies. The County's current management role involves only the authorization for planning, constructing, and operating wastewater services and includes no direct management of facilities.

In the County MW&SSP, alternatives were presented for the provision of wastewater services in unincorporated areas of the County. The "provision" of wastewater services as used in the County MW&SSP is similar to the definition of management presented in this section. These "provision" alternatives are summarized in Section 1.3.4 of this report. The basic premises considered in developing these alternatives were: (1) the County remaining in a nonprovider role and (2) the County changing to a provider role.

The development and selection of management options depends on the physical wastewater facilities to be used for future needs, the existing management scenarios, and the potential management entities' capabilities.

A large centralized facility can only be adequately operated and maintained by a single, large organization. This is due to the technical sophistication normally required for large centralized wastewater collection, treatment, and disposal units. Only a single, large organization has the resources and continuity to meet the needs of such a system. Potential management entities in the study area include the City, the County, or a joint venture between the two. The joint venture could include the creation of a single agency comprised of staff from both the City and the County or it could include a division of management duties between the two. An example of division of duties is to have one entity, such as the County, managing all or part of the collection and interceptor facilities and the other entity, the City, managing the treatment and disposal facilities. The City has an advantage over the County in that it has an existing Water and Sewer Department that is experienced in managing large systems. TECO's ability to manage a large centralized facility is unknown in that it is only experienced with managing facilities that process flows of 0.3 MGD or less.

Small area facilities, such as those currently operated by TECO, and a combination of small private entities can be managed individually as is currently done or they can be managed by one large organization such as that described for a large centralized facility. Having one organization manage many small wastewater facilities has the advantage of conformity to one uniform set of standards for operation and maintenance and of access to a large pool of specialized labor force and inventories that small, individual managers may not have. The disadvantages of centralized management for a decentralized system is the logistic problems that occur when managing remote facilities distributed over a large geographic area and the potential slowing of response time to problems occurring at these remote sites due to the requirements of bureaucratic procedures normally found in large organizations.

A variation of individual management and centralized management of decentralized facilities is a joint-venture. The joint-venture can take one of several forms. One scenario could have a large entity, such as the City or the County, plan, construct and/or own the facilities and another entity or group of entities operate and maintain the facilities.

In regards to on-lot wastewater systems, management normally consists of the County Department of Health approving the site, the private owner building and maintaining the facility, and the Department of Health inspecting problems as they occur. No management option is proposed to replace this procedure but it is recommended that the County continue to document all inspections and problems to provide information for future wastewater management planning tasks and to control adverse environmental impacts.

2.3.7 Industrial Pretreatment

The State of Florida does not have primacy over industrial waste pretreatment; therefore, it is overseen by EPA Region IV. Currently, the City of Tallahassee has no surface water discharges of wastewater effluent and is not required to implement a pretreatment program since they do not have any NPDES permits. The City has conducted a Sewer System Inventory Program which has provided them with flow data on their industrial customers. The City does not have any categorical industries connected to the sewer system and has only minimal industrial development within their service area. Presently, the only major industrial sewer customers include a crab processing plant, a gear manufacturer (Stanadyne for General Motors), and two (2) university laboratories.

The City is revising their Sewer Use Ordinance to include specific requirements for industrial wastewater pretreatment. The adoption of this ordinance is expected to result in the implementation of a pretreatment program by requiring industries to:

1. Obtain industrial waste discharge permits;
2. Meet specified discharge limits;
3. Install monitoring manholes; and
4. Conduct quarterly self-monitoring and document the results in a report to the City.

2.4 ALTERNATIVE WASTEWATER MANAGEMENT SYSTEMS SCREENING

2.4.1 Preliminary Cost Evaluation

Combinations of the previously described alternative components were analyzed to compose total wastewater management system alternatives. Three alternative system scenarios were devised based on the collection and treatment components. These basic scenarios are as follows:

1. Centralization with conventional conveyance and treatment of wastewater in the south at the existing Lake Bradford Road Plant and T. P. Smith Facility.
   Improve Lake Bradford Road Plant (4.5 mgd).
   Improve and expand T. P. Smith Facility (27.5 mgd).
   Total design flow = 31.0 mgd.
   Components include C1, T1, and T2.

2. Centralization with conventional conveyance and treatment of wastewater in the south at the existing Lake Bradford Road Plant and T. P. Smith Facility and in the north at a new NE plant.
   Improve Lake Bradford Road Plant (4.5 mgd).
   Improve and expand T. P. Smith Facility (21.3 mgd).
   Add new NE Plant (5.2).
   Total design flow = 31.0 mgd.
   Components include C2, T1, T2, and T3.

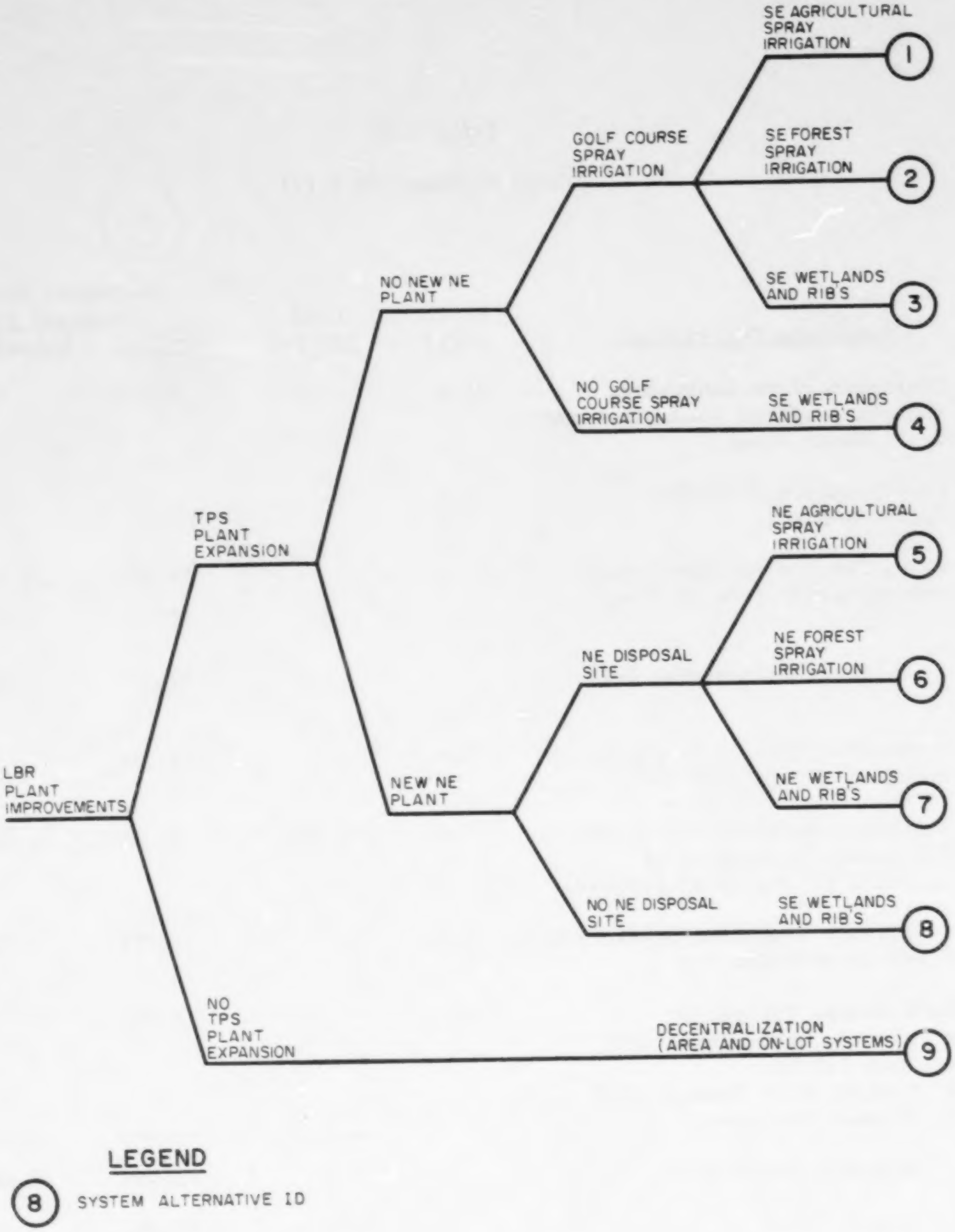
3. Decentralization
   Continue to use on-lot systems and area systems to meet future wastewater management needs.
   Improve lake Bradford Road Plant (4.5 mgd).
   Components include C19, T1, T4, and T5.

A "total system" alternative incorporates one of these basic scenarios with selected components for the conveyance and disposal of treated wastewater. Figure 2-5 is a decision tree that illustrates the major decision points that lead to the development of system alternatives. The selection of the components that are addressed in this decision tree was based on capital costs in that those combination of components with the lowest capital costs per unit of design flow were included. It should be noted that the artificial wetland disposal component was merged with the RIB disposal component for system alternatives 3, 4, 7 and 8. No streams are nearby that are permitted to receive the discharge from the wetlands therefore RIB's are proposed to receive the high quality wetland effluent. Since RIB's in the study area can safely handle only effluent that has received high levels of treatment, merging the two as one disposal facility overcomes these shortcomings and takes advantage of the components.

Tables 2-11 through 2-19 are summaries of the composite "total system" alternatives which were chosen based on the reasonableness of their cost estimates and implementability characteristics. Alternative system A9 is essentially the "No- Federal-Action" alternative that was the selected preferred alternative of the 1983 EIS. Subsequently, it is included so that it will receive detailed evaluation along with the selected centralized system alternatives. Figure 2-6 and 2-7 exhibit the major components of the eight (8) centralized system alternatives.

All system alternatives are sized to handle the total projected 2010 design flow of 31.0 mgd. The only exceptions are the TPS Plant and SE Sprayfield expansions of 7.5 mgd. These are the City's current level of planned expansions which would bring the total design flow capacities at the T. P. Smith Facility and the SE Sprayfield to 27.5 mgd. These capacities, together with the improved LBR Plant capacity of 4.5 mgd, provides a total treatment capacity of 32 mgd.

It should be noted that treatment components T4 and T5, on-lot systems and area systems, only include those flows (6.50 mgd) that would be connected to a centralized facility if a centralized system was selected. The remaining on-lot systems of the study area that handle a flow of 4.06 mgd (refer to Table 2-4) are not included because all system alternatives would have this component.


LBR PLANT IMPROVEMENTS
TPS PLANT EXPANSION
NO NEW NE PLANT
GOLF COURSE SPRAY IRRIGATION
SE AGRICULTURAL SPRAY IRRIGATION
1
SE FOREST SPRAY IRRIGATION
2
SE WETLANDS AND RIB'S
3
NO GOLF COURSE SPRAY IRRIGATION
SE WETLANDS AND RIB'S
4
NEW NE PLANT
NE DISPOSAL SITE
NE AGRICULTURAL SPRAY IRRIGATION
5
NE FOREST SPRAY IRRIGATION
6
NE WETLANDS AND RIB'S
7
NO NE DISPOSAL SITE
SE WETLANDS AND RIB'S
8
NO TPS PLANT EXPANSION
DECENTRALIZATION (AREA AND ON-LOT SYSTEMS)
9
LEGEND
8 SYSTEM ALTERNATIVE ID

DECISION TREE FOR SELECTED SYSTEM ALTERNATIVE DEVELOPMENT

FIGURE 2-5

TABLE 2-11

SYSTEM ALTERNATIVE 1 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Annual O&M
Treatment Plant Conveyance to Lake Bradford Road Plant and T. P. Smith Plant	31.0	---	52,586	404
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	7.5	---	14,902	1,916
Collection/Treatment Subtotal			68,251	2,414
Conveyance from T. P. Smith Plant to SE Disposal Site	7.5	---	5,016	66
Southeast Agricultural Spray Irrigation (expansion of existing 22 mgd SE Sprayfield)	7.5	1,410	5,724	1,045
Conveyance from Lake Bradford Road Plant to Golf Courses	3.0	---	3,717	56
Golf Course Irrigation o Florida State University o Jake Gaither o Capital City Country Club o Hilaman Municipal	3.0	---	2,998	78
Disposal Subtotal		1410	17,455	1,245
System Total		1410	85,706	3,659

(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-12

SYSTEM ALTERNATIVE 2 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Estimated Costs (Thousand $) Annual O&M
Treatment Plant Conveyance to Lake Bradford Road Plant and T. P. Smith Plant	31.0	---	52,586	404
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	7.5	---	14,902	1,916
Collection/Treatment Subtotal			68,251	2,414
Conveyance from T. P. Smith Plant to SE Disposal Site	7.5	---	5,016	66
Southeast Forest Spray Irrigation (expansion to existing 22 mgd SE Sprayfield)	7.5	1,475	12,256	384
Conveyance from Lake Bradford Road Plant to Golf Courses	3.0	---	3,717	56
Golf Course Irrigation o Florida State University o Jake Gaither o Capital City Country Club o Hilaman Municipal	3.0	---	2,998	78
Disposal Subtotal		1,475	23,987	584
System Total		1,475	92,238	2,998

(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-13

SYSTEM ALTERNATIVE 3 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Estimated Costs (Thousand $) Annual O&M
Treatment Plant Conveyance to Lake Bradford Road Plant and T. P. Smith Plant	31.0	---	52,586	404
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	7.5	---	16,232	2,109
Collection/Treatment Subtotal			69,581	2,607
Conveyance from T. P. Smith Plant to SE Disposal Site	7.5	---	5,016	66
Artificial Wetlands at SE Disposal Site	6.0	370	9,471	92
Rapid Infiltration Basins at SE Disposal Site	6.0	300	7,646	561
Conveyance from Lake Bradford Road Plant to Golf Courses	3.0	---	3,717	56
Golf Course Irrigation o Florida State University o Jake Gaither o Capital City Country Club o Hilaman Municipal	3.0	---	2,998	78
Disposal Subtotal		670	28,848	853
System Total		670	98,429	3,460

(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-14

SYSTEM ALTERNATIVE 4 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Annual O&M
Treatment Plant Conveyance to Lake Bradford Road Plant and T. P. Smith Plant	31.0	---	52,586	404
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	7.5	---	16,594	2,206
Collection/Treatment Subtotal			69,943	2,704
Conveyance from T. P. Smith Plant to SE Disposal Site	9.0	---	6,019	79
Artificial Wetlands at SE Disposal Site	9.0	554	14,006	123
Rapid Infiltration Basins at SE Disposal Site	9.0	450	11,468	822
Disposal Subtotal		1,004	31,493	1,024
System Total		1,004	101,436	3,728

(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-15

SYSTEM ALTERNATIVE 5 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Annual O&M
Treatment North and South Conveyance to Lake Bradford Road Plant, T. P. Smith Plant, and new NE Plant	31.0	---	36,207	333
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	1.3	---	2,583	332
Northeast Plant Construction	5.2	---	21,345	453
Collection/Treatment Subtotal			60,898	1,212
Conveyance from NE Plant to NE Disposal Site	5.2	---	1,685	39
Northeast Agricultural Spray Irrigation	5.2	2,235	31,704	669
Conveyance from T. P. Smith Plant to SE Disposal Site	3.8	---	2,541	33
Southeast Agricultural Spray Irrigation (expansion to existing 22.0 mgd SE Sprayfield)	3.8	712	2,900	530
Disposal Subtotal		2,947	38,830	1,271
System Total		2,947	99,728	2,483

(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-16

SYSTEM ALTERNATIVE 6 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $)	
			Capital	Annual O&M
Treatment North and South Conveyance to Lake Bradford Road Plant, T. P. Smith Plant, and new NE Plant	31.0	---	36,207	333
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	1.3	---	2,583	332
Northeast Plant Construction	5.2	---	21,345	453
Collection/Treatment Subtotal			60,898	1,212
Conveyance from NE Plant to NE Disposal Site	5.2	---	1,685	39
Northeast Forest Spray Irrigation	5.2	2,725	45,594	560
Conveyance from T. P. Smith Plant to SE Disposal Site	3.8	---	2,541	33
Southeast Forest Spray Irrigation (expansion of existing Sprayfield)	3.8	747	6,303	201
Disposal Subtotal		3,472	56,123	833
System Total		3,472	117,021	2,045

(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-17

SYSTEM ALTERNATIVE 7 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Annual O&M
Treatment North and South (MG2), Conveyance to Lake Bradford Road Plant, T. P. Smith Plant, and new NE Plant	31.0	---	36,207	333
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	1.3	---	3,502	454
Northeast Plant Construction	5.2	---	22,001	550
Collection/Treatment Subtotal			62,473	1,431
Conveyance from NE Plant to NE Disposal Site	5.2	---	1,685	39
Artificial Wetlands at NE Disposal Site	5.2	320	11,462	69
Rapid Infiltration Basins at NE Disposal Site	5.2	260	9,226	474
Conveyance from T. P. Smith Plant to SE Disposal Site	3.8	---	2,541	33
Artificial Wetlands at SE Disposal Site	3.8	234	6,049	67
Rapid Infiltration Basins at SE Disposal Site	3.8	190	4,842	356
Disposal Subtotal		1,004	35,805	1,038
System Total		1,004	98,278	2,469

(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-18

SYSTEM ALTERNATIVE 8 (1)

Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Annual O&M
Treatment North and South (MG2), Conveyance to Lake Bradford Road Plant, T. P. Smith Plant, and new NE Plant	31.0	---	36,207	333
Lake Bradford Road Plant Improvements	4.5	---	763	94
T. P. Smith Plant Improvement and Expansion from 20.0 mgd	1.3	---	3,502	454
Northeast Plant Construction	5.2	---	22,001	550
Collection/Treatment Subtotal			62,473	1,431
Conveyance from NE Plant to SE Disposal Site	5.2	---	10,006	96
Conveyance from T. P. Smith Plant to SE Disposal Site	3.8	---	2,541	33
Artificial Wetlands at SE Disposal Site	9.0	554	14,006	123
Rapid Infiltration Basins at SE Disposal Site	9.0	450	11,468	822
Disposal Subtotal		1,004	38,021	1,074
System Total		1,004	100,494	2,505

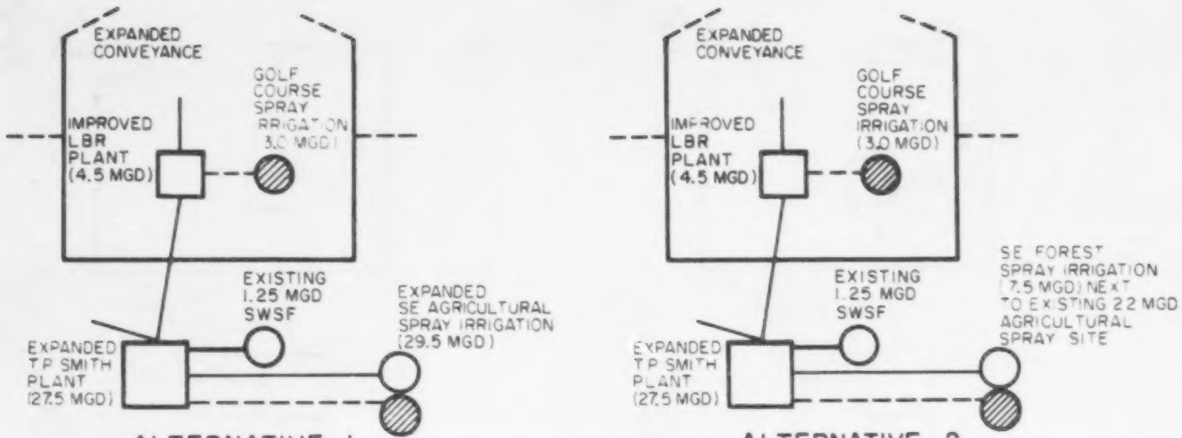
(1) Cost estimates in third quarter 1989 dollars.

TABLE 2-19

SYSTEM ALTERNATIVE 9 (1)

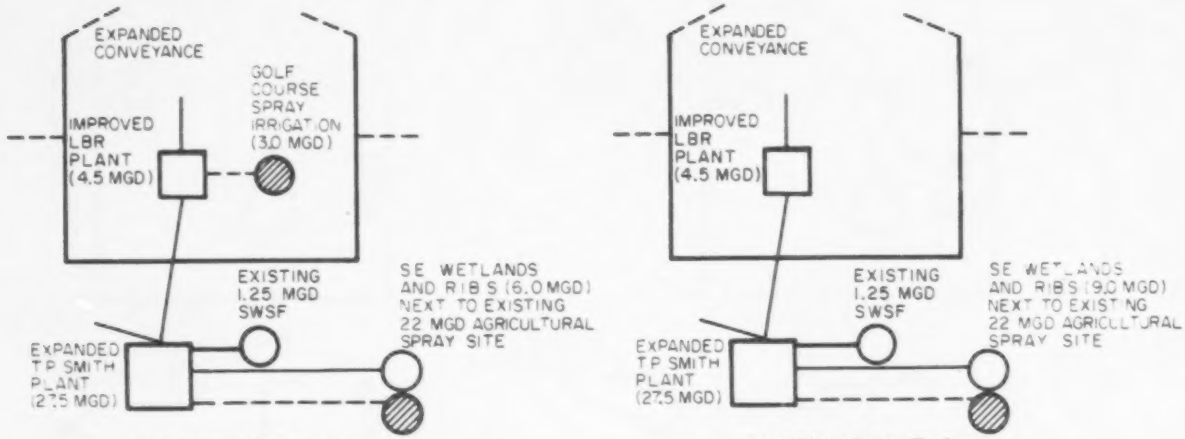
Component Description	Flow (mgd)	Land (Acres)	Estimated Costs (Thousand $) Capital	Estimated Costs (Thousand $) Annual O&M
Lake Bradford Road Plant Improvements	4.5	---	763	94
Treatment Decentralized (Conveyance for Area System Treatment)	0.25	---	1,008	9
Area System Treatment	0.25	---	1,130	145
On-lot Systems	6.25	---	93,298	921
Conveyance from T. P. Smith Plant to SE Disposal Site (2)	2.5	---	1,672	22
Southeast Agricultural Spray Irrigation (expansion to existing 22.0 mgd SE Sprayfield) (2)	2.5	469	1,908	349
System Total			99,779	1,540

(1) Cost estimates in third quarter 1989 dollars.
(2) Required expansion to handle flows from the LBR Plant (4.5 MGD), TPS Plant (17.5 MGD) and SW Plant (2.5 MGD)


EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
GOLF COURSE SPRAY IRRIGATION (3.0 MGD)
EXISTING 1.25 MGD SWSF
EXPANDED SE AGRICULTURAL SPRAY IRRIGATION (29.5 MGD)
EXPANDED T.P. SMITH PLANT (27.5 MGD)
EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
GOLF COURSE SPRAY IRRIGATION (3.0 MGD)
EXISTING 1.25 MGD SWSF
SE FOREST SPRAY IRRIGATION (7.5 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED T.P. SMITH PLANT (27.5 MGD)

ALTERNATIVE 1

ALTERNATIVE 2


EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
GOLF COURSE SPRAY IRRIGATION (3.0 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (6.0 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED T.P. SMITH PLANT (27.5 MGD)
EXPANDED CONVEYANCE
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (9.0 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED T.P. SMITH PLANT (27.5 MGD)

ALTERNATIVE 3

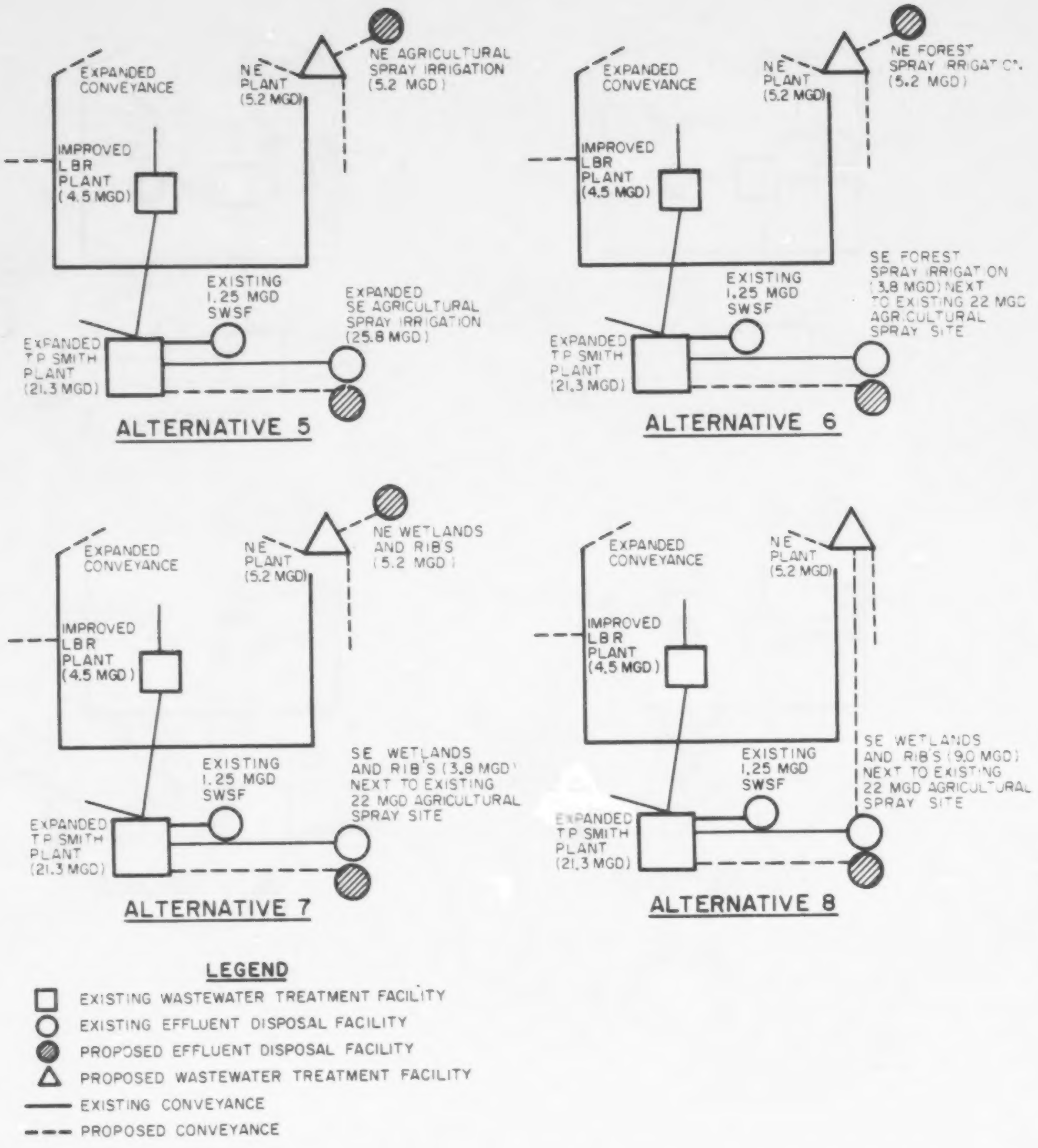
ALTERNATIVE 4

LEGEND

☐ EXISTING WASTEWATER TREATMENT FACILITY
○ EXISTING EFFLUENT DISPOSAL FACILITY
▨ PROPOSED EFFLUENT DISPOSAL FACILITY
— EXISTING CONVEYANCE
--- PROPOSED CONVEYANCE

CENTRALIZED WASTEWATER MANAGEMENT SYSTEM
ALTERNATIVES 1 THROUGH 4

FIGURE 2-6


EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
NE AGRICULTURAL SPRAY IRRIGATION (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
EXPANDED SE AGRICULTURAL SPRAY IRRIGATION (25.8 MGD)
EXPANDED T.P. SMITH PLANT (21.3 MGD)
ALTERNATIVE 5
EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
NE FOREST SPRAY IRRIGATION (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE FOREST SPRAY IRRIGATION (3.8 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED T.P. SMITH PLANT (21.3 MGD)
ALTERNATIVE 6
EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
NE WETLANDS AND RIBS (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (3.8 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED T.P. SMITH PLANT (21.3 MGD)
ALTERNATIVE 7
EXPANDED CONVEYANCE
NE PLANT (5.2 MGD)
IMPROVED LBR PLANT (4.5 MGD)
EXISTING 1.25 MGD SWSF
SE WETLANDS AND RIB'S (9.0 MGD) NEXT TO EXISTING 22 MGD AGRICULTURAL SPRAY SITE
EXPANDED T.P. SMITH PLANT (21.3 MGD)
ALTERNATIVE 8
LEGEND
□ EXISTING WASTEWATER TREATMENT FACILITY
○ EXISTING EFFLUENT DISPOSAL FACILITY
▨ PROPOSED EFFLUENT DISPOSAL FACILITY
△ PROPOSED WASTEWATER TREATMENT FACILITY
—— EXISTING CONVEYANCE
- - - PROPOSED CONVEYANCE

CENTRALIZED WASTEWATER MANAGEMENT SYSTEM
ALTERNATIVES 5 THROUGH 8

FIGURE 2-7

The flows, acreages, and estimated costs presented in the tables are only for the proposed new facilities and expansion components. Existing facilities' flows, acreages, and annual O&M costs are not included with the exception of the wastewater conveyance and the LBR Plant components. The conveyance component design flow, 31.0 mgd, is the study area's total projected flow for the year 2010. The LBR Plant's 4.5 mgd flow value is an existing design flow that will be achieved when the existing facilities are improved. The costs include the proposed plant improvements.

2.4.2 Preliminary Cost Evaluation

Tables 2-11 through 2-19 also provide cost estimates for capital project and annual operation and maintenance costs for each of the system alternatives. These estimates are summarized in Table 2-20, and they include a present worth value for each alternative. Present worth analysis is a method of alternative comparison that incorporates both initial capital outlay and future annual costs. These costs are the basis for the evaluation of selected system alternatives in Chapter 3. Costs for the LBR Plant improvements, the TPS Plant expansion, and the SE Agricultural Sprayfield expansion (including force main conveyance) were based on costs taken from the City's 5-year capital budget. Costs for the Killearn Lakes Plant expansion were based on estimates obtained from TECO staff. All other costs were calculated using cost curves provided in various EPA manuals and historical cost data provided by Gannett Fleming's design engineers. The capital costs include contingencies which are percentages of the construction costs (15% for engineering design, 10% for legal and administrative costs, and 5% for interest during construction). The only exceptions are the capital costs for the TPS Plant expansion (excluded engineering design costs because design already has been completed) and on-lot systems (no contingencies included).

It should be realized that alternatives incorporating agricultural or silvicultural operations, as is the case for Alternatives 1, 2, 5, and 6, will receive revenues from the sale of their harvested crops. The amount of revenues will vary greatly depending on the type of crop, the crop's current market value, and the type of growing season experienced for a given year. Subsequently, these revenues are not accounted for in the cost estimation process.

2.4.3 Environmental Evaluation

This section summarizes the significant environmental impacts associated with each of the nine (9) proposed system alternatives. These impacts were evaluated along with costs and technical feasibility to select the system alternatives for detailed evaluation (refer to Section 2.4.6). The environmental impacts and associated mitigative measures for the selected system alternatives are addressed in more detail in Chapter 3.

TABLE 2-20

SUMMARY OF SYSTEM ALTERNATIVES PROJECT COSTS AND PRESENT WORTH VALUES(1)

Alternative				Estimated Costs (Thousands $)		
ID	Description	Flow (mgd)	Land (acres)	Capital	Annual O&M	Present Worth(2)
1	Treatment South			85,706	3,659	119,407
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	7.5				
	o SE Agricultural Spray Irrigation	7.5	1,410			
	o Golf Course Irrigation	3.0				
2	Treatment South			92,238	2,998	119,851
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	7.5				
	o SE Forest Spray Irrigation	7.5	1,475			
	o Golf Course Irrigation	3.0				
3	Treatment South			98,429	3,460	130,297
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	7.5				
	o SE Artificial Wetland with RIB's	6.0	670			
	o Golf Course Irrigation	3.0				
4	Treatment South			101,436	3,728	135,773
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	7.5				
	o SE Artificial Wetland with RIB's	9.0	1,004			
5	Treatment North and South			99,728	2,483	122,598
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	1.3				
	o NE Plant	5.2				
	o NE Agricultural Spray Irrigation	5.2	2,235			
	o SE Agricultural Spray Irrigation	3.8	712			

(1) Cost estimates are in third quarter 1989 dollars.

(2) Assumes an 8.875 percent compound interest rate for a 20 year period. Capital recovery factor = 0.01085724 and present worth factor = 9.210445.

TABLE 2-20 (Cont'd.)

SUMMARY OF SYSTEM ALTERNATIVES PROJECT COSTS AND PRESENT WORTH VALUES(1)

Alternative		Flow	Land	Estimated Costs (Thousands $)		
ID	Description	(mgd)	(acres)	Capital	Annual O&M	Present Worth(2)
6	Treatment North and South			117,021	2,045	135,856
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	1.3				
	o NE Plant	5.2				
	o NE Forest Spray Irrigation	5.2	2,725			
	o SE Forest Spray Irrigation	3.8	747			
7	Treatment North and South			98,278	2,469	121,019
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	1.3				
	o NE Plant	5.2				
	o NE Artificial Wetland with RIB's	5.2	580			
	o SE Artificial Wetland with RIB's	3.8	424			
8	Treatment North and South			100,494	2,505	123,566
	o Lake Bradford Road Plant	4.5				
	o T. P. Smith Plant	1.3				
	o NE Plant	5.2				
	o SE Artificial Wetland with RIB's	9.0	1004			
9	Decentralized			99,779	1,540	113,963
	o Lake Bradford Road Plant	4.5				
	o Killearn Lake Plant Expansion	0.25				
	o On-lot	6.25				
	o SE Agricultural Spray Irrigation	2.5	469			

(1) Cost estimates are in third quarter 1989 dollars.

(2) Assumes an 8.875 percent compound interest rate for a 20 year period. Capital recovery factor = 0.1085724 and present worth factor = 9.210445.

The centralized proposed system alternatives require additional collection conveyance pipelines to supplement the existing lines. The locations of these pipelines have been designed to follow existing rights-of-way in order to avoid environmental and cost problems. Of the eight (8) centralized alternatives, four (4) will require construction of the NE Plant. The NE Plant will allow wastewater generated in northeast Tallahassee to be conveyed a short distance to the NE Plant. Without construction of the NE Plant, wastewater generated in the northeast area must be conveyed via existing pump stations to the TPS Plant on the southwest side of Tallahassee. The environmental impacts of the conveyance pipelines necessary for the selected system alternatives will be discussed in greater detail in Chapter 3.

The major environmental concerns for all the alternatives are related to the alternatives' effluent disposal components. Disposal for each of the alternatives involves either two or three land application sites. Table 2-21 summarizes the sensitive environmental characteristics of each site that were evaluated to determine the impacts associated with each disposal component.

Any areas found to have longleaf pine-wiregrass plant communities would require special consideration because the FG&FWFC has identified these communities to be in need of protection. Ecological as well as archeological/historical resources may be impacted. Discovery of an archeological site would require the contractor to stop construction and consult with the Florida SHPO of the location so that a detailed survey can be conducted.

2.4.3.1 System Alternative 1: Treatment South, SE Agricultural and Golf Course Spray Irrigation

Environmental concerns associated with the construction and operation of Alternative 1 are mainly due to the expansion of the existing SE Agricultural Spray Irrigation area. The expansion areas lie within the Cody Scarp Sandhills, the Lutterloh Pond closed basin, and the Woodville Karst Plain, and is adjacent to the St. Marks River Lowlands. These areas are marked by outstanding-quality mature cypress and gum swamps and marshes, good or outstanding-quality lakes and ponds, flood-prone Karst depressions, and good to high quality wetlands. A rich assortment of fauna and flora, several species of which are of special concern or endangered, are known to utilize the region as a cover and food source. Conversion to intensive agriculture will likely create adverse affects to this sensitive ecotone by removing valuable habitat associated with the bottomland forest systems. Existing functions such as surface water hydrology, sediment transport and detention, water quality, and native biotic diversity will likely be impacted by this alternative. It should be noted, however, that this area is not pristine and is largely composed of managed pine plantations in the area projected for use.

Golf course irrigation will probably not cause any significant impacts. One concern may be the production of aerosols by the sprinkler nozzles. The aerosols are known to migrate by wind to off-site locations, but these distances are limited to several hundred yards and the concentration of pathogens within the aerosols decreases over time and distance. There are numerous ways to decrease aerosols from this commonly-used wastewater disposal system, including specially designed nozzles and timing the spray operations to coincide with those times of no or low usage of the course and low wind factors. By using golf-courses, there will be a reduced need to implement other disposal systems on more environmentally sensitive sites.

Table 2-21
Summary of Environmental Characteristics of Effluent Disposal Sites

Proposed Effluent Disposal Site	Acreage	Physiographic Region	Principle Closed Basin	Quality of Water Bodies and Wetlands	Upland Plant Community	Level of Recharge for Floridan Aquifer	Wildlife Habitat
Site 1- West of and adjacent to existing SE Sprayfield	400	Cody Scarp Sandhills	Lutterloh Pond	Good to High	Former longleaf pine-wiregrass sandhill habitat converted to sand pine and slash pine plantations with moderate to low amounts of wiregrass	High	Possible migration corridor for gopher frogs
Site 2-East of and adjacent to existing SE Sprayfield	1600	Cody Scarp Sandhills with some southern portions in the Woodville Karst Plain	Eagle Lake	Outstanding cypress and gum swamps and marshes and good to outstanding lakes and ponds	Former longleaf pine-wiregrass sandhill habitat converted to sand pine and slash pine plantations with moderate to low amounts of wiregrass	High	Woodstorkes have been seen flying near the lakes and may feed or roost in them
Site 3-NE Sprayfield	6500	Tallahassee Red Hills	Six watersheds that drain into Alford Arm of Lake Lafayette	Poor to outstanding, 1/3 to 1/2 of wetlands have been eliminated and most are substantially smaller than indicated on the Leon County E.S.A. maps	Former longleaf pine-wiregrass clayhill habitat converted to a mixture of cultivated crop and pasture, old-field successional loblolly pine-shortleaf pine forest (~2000 acres), nature oak-pine-hickory forest (~300 acres), nature live oak forest, young successional pines and hardwoods and pine plantations	Low to None with spots of High	Woodstorkes live in the Lower Lake Lafayette's pure cypress stands

Source: Environmental analysis based on field visits to the sites by Tom Greene, Environmental Specialist for the Leon County Public Works Department, November, 1989.

The conveyance system necessary for implementation of this alternative consists of:

1) a force main from the TPS Plant eastward along Capital Circle and Old Tram Road to the SE Disposal Site, and

2) a primary line along Lake Bradford Road and Orange Avenue with pipelines supplying effluent to four golf courses.

Both lines are to be constructed within existing rights-of-way, hence causing little damage to environmentally sensitive areas. There will be some impacts during construction, such as noise, dust, and heavy machinery exhaust, but these are common to virtually all projects of this nature, and will cease when construction is complete. No long-term impacts are foreseen.

2.4.3.2 System Alternative 2: Treatment South, SE Forest and Golf Course Spray Irrigation

The implementation of Alternative 2 will cause environmental disturbance and possibly permanent change to the existing ecotone.

The SE Forest Spray Irrigation system will cause an initial disturbance associated with construction activities related to the buried irrigation system and to the replacement of existing longleaf forest stands with water-tolerant species. Existing forest stands on the SE disposal site consist primarily of water-tolerant species, sand pine and slash pine (refer to Table 2-21). The sand pine, though water-tolerant does not generate much biomass. Therefore, existing trees should be replaced with fast growing, water-tolerant species.

After the irrigation system has been installed, effluent would be applied at a rate compatible with the site's ability to accept water. This rate would have to be monitored carefully so as not to interfere with the site's natural ability to transport sediment and overland flow, absorb natural precipitation, conserve surface soil, assimilate nutrients, and support healthy, diverse, and native vegetative and animal life.

The forest site would be managed by maintaining, harvesting, and reforesting of fast-growing, water-tolerant forest stands. During periods of harvest, whether every 10 years in a selective harvest practice, or every 25 years on a clear-cut practice, there will be damage to the site and soil.

The impacts caused by the golf course irrigation disposal method and the conveyance system will be identical to those described for Alternative 1 in Section 2.4.3.1.

2.4.3.3 System Alternative 3: Treatment South, SE Artificial Wetlands/RIB's and Golf Course Spray Irrigation

Environmental concerns associated with Alternative 3 are primarily due to the construction and operation of the SE Artificial Wetlands with Rapid Infiltration Basins. The construction and operation of artificial wetlands could be an attractive alternative because of the relatively small land requirement. For a design flow of 6.0 mgd, for example, only 370 acres would be necessary. An additional 300 acres is needed for the rapid infiltration basins, but the total of 670 acres is still far less than the disposal alternatives with agricultural or forest spray irrigation facilities.

The primary concerns associated with the rapid infiltration basins are groundwater mounding and contamination, and possible sinkhole formation. The effluent going to these basins will already have been treated by both the treatment plant and the wetlands and therefore have received a high level of treatment, which is greater than secondary levels.

The impacts caused by the golf course irrigation disposal method and the conveyance system will be identical to those described for Alternative 1 in Section 2.4.3.1.

2.4.3.4 System Alternative 4: Treatment South, SE Artificial Wetlands/RIB's

Environmental impacts caused by Alternative 4 will be similar in nature to those caused by Alternative 3, except there is no golf course irrigation component in Alternative 4. Therefore, the artificial wetlands and rapid infiltration basins are larger to make up the difference and the land area requirements are increased by approximately 50%. This is important, considering the habitat of the gopher frog.

The treated effluent conveyance system used in this alternative will require only a force main from the TPS Plant to the SE Disposal Site via the Capital Circle Southwest and Old Tram Road right-of-way. Construction-related impacts such as noise, dust, and exhaust will occur along this corridor, but no long-term impacts on environmentally sensitive areas are foreseen.

2.4.3.5 System Alternative 5: Treatment North and South, NE and SE Agricultural Spray Irrigation

Environmental impacts associated with Alternative 5 are due mainly to the NE and SE agricultural spray irrigation facilities. The impacts from the expansion of the SE site have been discussed in Section 2.4.3.1. The addition of the NE sprayfield area would create additional problems. First, the clay soils will induce spray effluent and any added fertilizers to reach surface waters and hence affect wetlands, ponds, and streams.

A larger issue regarding the NE site is the extensive high-quality successional and native forest, which constitutes about 50 percent of the site's uplands. Any management scheme employed on this site would likely destroy most or all of the existing plant and animal life. The conversion of existing forest to agricultural fields would destroy valuable habitat.

Construction of the NE plant would take place in an area adjacent to the spray site, and would cause impacts much like those noted above.

There would be considerable environmental impact due to the construction and maintenance of pipelines into and out of the proposed NE plant. The NE Disposal Site for this alternative is located in the Lake Lafayette Lowlands, which are characterized by wet pine flatwoods, successional pine-hardwoods, and likely beech-magnolia hammocks. Unless the proposed pipelines follow existing rights-of-way along Miccosukee Road, Route 90 or Route 10, there will be a substantial amount of vegetation, habitat, and wetland loss and disturbance. The conveyance from the TPS Plant to the SE Disposal Site will not present a significant environmental impact since the pipeline will follow existing rights-of-way.

2.4.3.6 System Alternative 6: Treatment North and South, NE and SE Forest Spray Irrigation

Implementation of Alternative 6 will create environmental impacts which are similar to Alternative 2, discussed in Section 2.4.3.2 in that the disposal method is forest spray irrigation. As noted in Table 2-21, the NE disposal site has large areas of water-tolerant tree species (loblolly pine and shortleaf pine forest). Any areas of this site that do not have water-tolerant tree species would have to have the existing tree stands replaced. Any area found to have longleaf pine-wiregrass plant communities would require special consideration because the FG&FWFC has identified these habitats to be in need of protection. This method has an advantage over agricultural spray irrigation because once construction is completed, there is relatively little disturbance of the forest, except at harvest time which is to occur for a given plot at intervals of no less than 10 years. The NE plant is also a component of Alternative 6 and would cause impacts much like those noted for the preparation of agricultural irrigation discussed in Section 2.4.3.5.

The environmental impacts due to construction of the treated effluent conveyance system will be identical to those for Alternative 5.

2.4.3.7 System Alternative 7: Treatment North and South, SE and NE Artificial Wetlands/RIB's

Alternative 7 requires artificial wetlands and rapid infiltration basins to be constructed in both the SE and the NE sites. Construction in forested areas will require removal of trees and hence habitat, but generally, the alternative is an environmentally sound one. The land area required for this alternative (580 acres in NE and 424 acres in SE) is relatively small.

The treated effluent conveyance system necessary for implementation of this alternative will be similar, if not identical, to that used for Alternatives 5 and 6. The environmental impacts will therefore be similar, if not identical.

2.4.3.8 System Alternative 8: Treatment North and South, SE Artificial Wetlands, RIB's

The environmental concerns associated with Alternative 8 are identical to Alternative 7, except there will be no wetland development at the NE site.

The treated effluent conveyance of wastewater in this alternative consists of: 1) the force main along Capital Circle, as described in Alternative 1; and 2) a force main, approximately 12 miles in length, from the NE Plant to the SE Disposal Site. The long-term environmental impacts created by this construction are limited to a 1-mile segment immediately south of the NE Plant and north of Miccosukee Road. The area is characterized by Loblolly -Shortleaf Pine forest, Oak-Pine-Hickory forest, Live Oak forest, and cultivated crop, pasture land, and pine plantation. Construction of the conveyance pipeline and right-of-way will impact one or more of these community types by the removal of vegetation and habitat.

2.4.3.9 System Alternative 9: Decentralization

Environmental impacts caused by Alternative 9, or decentralized treatment/disposal, are due to on-lot systems and the SE agricultural spray irrigation facility. Refer to Alternative 1 of Section 2.4.3.1 for impacts caused by the SE facility. It should be noted, however, that with a decentralized system, the acreage required for a SE Sprayfield expansion is reduced from 1410 to 235.

Because of the hydraulic connection and proximity between surface and groundwaters in the area, on-lot systems could cause significant problems if they fail. Excessive nutrient loads and BOD could enter the aquifer system. This condition is not easily remedied, and an alternative system would need to be installed.

The on-lot systems have an advantage in that they at least temporarily eliminate the need for alternatives which require large land areas to operate.

The environmental consequences due to the construction of a conveyance pipeline from the TPS Plant to the SE Disposal Site will be minimal. The force main will utilize the existing right-of-way corridor following Capital Circle Southwest and Old Tram Road. Long-term impacts are not foreseen.

2.4.4 Technical and Institutional Feasibility

Technical feasibility of a system alternative includes evaluating the proposed action in terms of installation (or construction) and operation and maintenance of the proposed facilities. Table 2-22 lists the major potential installation and operation problems for the recommended components of the alternative systems.

The feasibility of installing or constructing any of the alternatives depends on ease of installation or construction, availability of materials, and availability of manpower experienced in operating and maintaining the structural facilities associated with each alternative. None of the alternatives has any severe technical constraints in terms of installation or construction. Septic tanks, sewers, extended aeration treatment plants for area systems, an activated sludge treatment plant, and spray irrigation and sludge spreading systems are already being utilized within the study area. The rapid infiltration basins recommended for possible use following artificial wetlands have only been used in the study area on an experimental basis. However, because this disposal system is similar to a stabilization pond, in terms of construction and installation, the fact that one has never been constructed in the study area before cannot be considered a severe technical constraint. As for artificial wetlands, the design proposed is a relatively new and innovative disposal technique which has not yet been used inside the study area and has had only limited use outside the study area. Biologically, the proposed artificial wetlands resemble horizontal trickling filters.

Operation and maintenance characteristics have been broken down into the following criteria: reliability, flexibility, and ease of operation and maintenance for both the homeowner and the managing entity for public systems. The reliability of a wastewater management system is reflected in its ability to consistently achieve and maintain water quality and other environmental goals for which it is intended with a minimum of operational problems. The flexibility of an alternative is measured in terms of its capability to adapt to higher future wastewater flows and its ability to comply with future changes in water quality goals. For example, an activated sludge system has the ability to accept higher flows and still achieve the desired treatment performance. The ease of operation and maintenance of an alternative must be considered in terms of the amount of attention required to maintain the desired reliability.

The comparison of the technical feasibility of centralized wastewater management systems (Alternatives 1 through 8) versus a decentralized wastewater management system (Alternative 9) is presented in Table 2-23. Area systems, part of a decentralized system, are subject to many of the problems associated with the components of a centralized system in addition to potential management problems which come with being decentralized.

TABLE 2-22

POTENTIAL INSTALLATION AND OPERATION PROBLEMS OF SYSTEM COMPONENTS

Type of Component	Concerns with Installation and Performance
Interceptor Sewers	- Obtaining rights-of-way prior to installation
	- Anaerobic conditions if wastewater is within a sewer for a long period of time
	- Possible surface water degradation resulting from construction-related soil erosion
Activated Sludge Treatment of Wastewater	- Disruption of microorganism activity due to sudden shock
Wastewater Disposal by Rapid Infiltration	- Lack of local familiarity with operation procedures
	- More attention needed for proper maintenance of inundation basins
	- Performance reliability highly dependent on physical, chemical and biological constituents found in soil profile
Sludge Treatment	
a) Anaerobic digestion	- Performance is susceptible to changes in loadings, flows, and temperature
b) Vacuum filtration	- Performance may vary with digested sludge characteristics
Sludge Disposal by Landspreading	- Uncertainty of predicting rainfall patterns immediately following an application of sludge.
Wastewater Disposal by Slow Rate (Spray Irrigation)	- Performance reliability highly dependent on physical, chemical and biological constituents found in soil profile
	- Buried lines for spray irrigation of lands requires a significant amount of excation and land disturbance
	- Spraying of treated wastewater requires special care to avoid clogging of nozzles

TABLE 2-23

SUMMARY OF THE TECHNICAL FEASIBILITY OF CENTRALIZED VS. DECENTRALIZED SYSTEMS

	Centralized Plant (1) and Collection System	On-Site Systems(2)
Installation and Construction	o Expertise is available. o Terrain will not be a problem. o No severe technical constraints.	o Expertise is available. o Attention to site characteristics necessary; sites or systems may require some modification.
Operation and Maintenance (O&M)	o Reliability good if well trained staff maintained. o Flexibility, in a well-designed system, will not be a problem. o System may possibly be complex and difficult to operate and maintain, if unfamiliar with operation.	o Reliability may be a problem particularly with individual responsibility for each system. o Flexibility problems possible in that the systems must be tailored to local conditions. o Simple system to operate and maintain.

(1) System Alternatives 1 through 8.

(2) System Alternative 9.

As mentioned before, there are no severe technical constraints associated with installation or construction of a centralized plant and collection system or a decentralized system. Care must be taken in the selection of sites for wastewater disposal, sludge disposal, and on-site systems; site selection is of greater concern in a decentralized wastewater management system.

A centralized system appears to present the least amount of O&M problems because of the well-defined responsibility and the centralized nature of collection and treatment systems. Alternative 9 is characterized by a substantial number of on-site and area systems dispersed over a large geographical area, which leads to a decentralized and somewhat less defined management responsibility.

As shown on Table 2-23, the majority of operation and maintenance concerns with centralized wastewater management systems deal with the reliability of the systems under uncertain conditions. For example, in the activated sludge treatment of wastewater, the microorganism activity can be disrupted by sudden, shock loadings of flows entering aeration basins. Also in the landspreading of sludge or spray irrigation of treated effluent, an unexpected heavy rain immediately following a land application effort may cause excessive runoff. These problems can be managed, however, by providing and maintaining a well-trained staff of operation and maintenance personnel.

Wastewater management under Alternative 9, Decentralization, leaves the responsibility for proper operation of disposal systems to individual home owners. In order to improve the reliability of a decentralized system, the possibility of a Tallahassee-Leon County wastewater management agency, similar to the jointly operated Tallahassee-Leon County Planning Department, should be investigated. This agency would assume responsibility for the management of these on-lot and area systems and could have a variety of functions:

- Inventory and review of existing alternative systems.
- Planning, including evaluation of alternative systems for individual communities, and guidelines for site evaluation, design and installation.
- Involvement with operation and maintenance such as homeowner notification and approval of maintenance experts.
- Financing clearinghouse.
- Water quality monitoring.
- Public education.
- Coordination with related programs.
- Stockpiling of replacement parts.

From a planning point of view, the decentralized system has less flexibility due to limitations of soils within parts of the study area. In addition, it is thoroughly documented that retrofitting of houses to a centralized system often occurs as development density increases. Centralized alternatives can be tailored to the needs of the community, whereas the decentralized alternative is tailored around local conditions. The use of area systems in the decentralized system will increase its flexibility for planning significantly.

All of the alternatives have good flexibility from a systems point of view. The decentralized system would have greater flexibility for handling higher future wastewater flows because of the large amount of suitable soils in the study area.

In comparing the operating and maintenance characteristics of the alternative systems, it may seem that wastewater treatment plants are more difficult to operate and maintain than a less complex on-lot or area system. However, the individual homeowner has more responsibility in the maintenance of a septic tank, unless the system is taken over and maintained by a managing agency. Thus, it would probably be easier to operate and maintain a centralized sewer system and treatment plant, or plants, than the on-site systems of each customer.

2.4.5 Implementability and Mitigative Measures

The primary stages of a wastewater management project include:

- Planning and design.
- Construction.
- Operation and maintenance.
- Public acceptance.

Within each of these stages, measures can be incorporated which mitigate adverse impacts or enhance beneficial impacts. Mitigative measures are often financially justifiable and are considered more essential than enhancement measures in terms of implementing an acceptable alternative. This section summarizes appropriate implementation procedures and how mitigative measures can be inserted into the procedures. One mitigative measure that applies to all construction activities is to minimize the disturbance at all sites to reduce soil erosion and destruction of vegetation and animal habitats.

2.4.5.1 Conveyance Facilities

The planning, design and construction procedure for the interceptors in conveyance systems should include the following to mitigate the adverse impacts of their construction:

- Transit surveys of corridor routes.
- Planning measures and restrictive construction techniques to mitigate impacts of interceptor construction particularly at stream crossings.
- Designing interceptors and mitigative measures including erosion and stormwater runoff control techniques.

- Securing contractor services.

2.4.5.2 Wastewater Disposal Facilities

Table 2-24 summarizes the evaluation of land disposal techniques for implementability. The components were analyzed to verify their viability based on implementability and any potential mitigative measures. Below is a list of components that have been identified as non-viable alternatives or "conditionally" viable alternatives along with the condition that eliminates them from further evaluation or imposes a condition for successful implementation and operation:

Component	Condition
D14 - Surface Water Discharge of Plant Effluent	FDER has classified the Ochlockonee and St. Marks Rivers as Special Waters, thereby imposing a zero effluent limitation.
D15 - Deep Well Injection	FDER requires information on the location of a saline formation to receive the effluent and the availability of reasonable transmissivities (refer to Section 2.2.1.2).
D1, D2, D3, D4, D6, D7, D8, D9, and D13	Application rates for these slow rate processes must be carefully calculated and maintained to avoid ponding and groundwater contamination. Wells should be installed for continuous monitoring.

Implementation of any of the land application disposal components requires a soil survey and site layout during the planning and design process. This will be most extensive for disposal sites in the Northeast service area since portions of the Southeast site have already been utilized for disposal. The site layout procedure will need to include planning of buffer zones and runoff controls such as diversions or storage basins. It is recommended that soil surveys be periodically undertaken during the operations of any implemented facility.

2.4.5.3 On-Lot Treatment and Disposal Facilities

Also considered as a part of the alternative's implementability analysis is the need to "correct" failing on-lot systems documented by the LCPH. For system alternatives recommending centralized collection and treatment, many on-lot and some area systems would be replaced with connections to the central system. Any remaining failing systems would need to undergo remedial action. In some cases, this remedial action would involve replacing failing septic tanks/ drainfields with connections to area systems. Table 2-25 summarizes potential failure types and corrective actions for a typical septic tank/soil absorption field system.

TABLE 2-24

WASTEWATER LAND DISPOSAL TECHNIQUES
IMPLEMENTABILITY
ADVANTAGES AND DISADVANTAGES

ID	Description	Advantage	Disadvantage
D3, D4	Forest Spray Irrigation	o Produces a marketable product including construction lumber and tree chips for fuel. o Has good nitrogen-consumption potential. o Conserves groundwater sources.	o Requires commitment of large land areas. o Requires special water-tolerant tree species. o Buffer zones needed for public acceptance.
D1, D2	Agricultural Spray Irrigation	o Produces a marketable fodder crop. o Has good nitrogen-consumption potential. o Conserves groundwater sources.	o High operational costs to prepare land, plant, and harvest. o Buffer zones needed for public health protection. o Requires commitment of large land areas.
D6, D7, D8	Golf Course Irrigation	o Nutrient value of wastewater may lessen fertilizer application. o Conserves groundwater sources.	o Requires high quality effluent to prevent public health risks. o Requires special low pressure spray nozzles pointed downward to minimize aerosol drift. o Restriction of spraying during windy days.
D8	Irrigation of Gardens	o Nutrient value of wastewater may lessen fertilizer application. o Conserves groundwater sources.	o Requires high quality effluent to prevent public health risks. o Reclaimed water is known to have adverse effects on some vegetation (e.g., azaleas and some tree species). o Requires special low pressure spray nozzles pointed downward to minimize aerosol drift. o Restriction of spraying during windy days.

TABLE 2-24 (Cont'd.)

WASTEWATER LAND DISPOSAL TECHNIQUES
IMPLEMENTABILITY
ADVANTAGES AND DISADVANTAGES

ID	Description	Advantage	Disadvantage
D9	Power Line Right-of-Way Irrigation	o Conserves groundwater sources.	o Will result in higher operational costs due to increased frequency of mowing irrigated areas.
D10	Sludge Disposal Field Application	o Minimal site preparation.	o Buffer zone needed for public health protection. o Extensive groundwater monitoring required to determine extent of contaminant leaching. o Inundation basins must be maintained to break-up soil clogging conditions.
D11, D12	Rapid Infiltration Basins	o Reduced area requirements. o Replenishes groundwater supplies over time.	o Required nitrogen control may add to treatment cost. o Increased possibility of sinkhole formation. o Extensive groundwater monitoring required to determine extent of contaminant leaching.
D13	Landscape Irrigation and Percolation Ponds	o Replaces existing and future withdrawal of groundwater.	o Requires high quality effluent to prevent public health risks. o Possible public resistance to have treated wastewater applied to "your backyard."
D15	Deep-Well Injection	o Reduced area requirements.	o Extensive groundwater monitoring required to determine extent of contaminants leaching. o Requires establishment of a pilot program to determine economic feasibility.

TABLE 2-24 (Cont'd.)

WASTEWATER LAND DISPOSAL TECHNIQUES
IMPLEMENTABILITY
ADVANTAGES AND DISADVANTAGES

ID	Description	Advantage	Disadvantage
D16, D17	Artificial Wetlands	o Reduced area requirements.	o Requires disposal of its discharge. o Requires the establishment of a pilot program to determine actual treatment efficiencies. o Buffer zone needed for public health protection.
T4	Soil Absorption Fields and Sand Mounds	o Easy to construct.	o Can become clogged if not periodically maintained. o Requires commitment of large land areas.

Note: D5 and D14 do not include land disposal techniques.

TABLE 2-25

FAILURES AND REMEDIAL ACTIONS
ON-LOT SYSTEMS (1)

Type of Failure	Remedial Action
Overloaded absorption field; septic tank effluent breaks through ground surface	o Increase absorption
	o Flow reduction measures
	o Eliminate clear water discharges
	o Oxidize clogging met; pump out and repair or replace septic tank
	o More frequent maintenance
	o Dosing
	o Modification of site or system: regrading/filling/alternate system
Insufficient renovation by soil absorption field	o Modification of site or system: filling/alternate system
	o Intercept flow to groundwater by subsurface drainage

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(1) Remedial action for failing on-lot systems also includes connecting to a centralized or area system.

For all on-site systems, mitigative measures can include the following:

- Development of a management group or other type of association to oversee all on-site system activities.
- Field tests of soils, permeability and other parameters for each lot that is to have an on-site system.
- Standardization of practices for firms that install on-site systems.
- Regular inspection and maintenance of on-site systems by a regulatory agency such as the LCPH.

According to the Leon County Public Health Unit, the successful operation of septic tank drainfields in the study area is a function of available soil storage above a confining layer and not necessarily the capacity of the soil to move water. Accordingly, percolation tests and the measuring of water table elevations before development may be misleading for determining the suitability of areas to accommodate drainfields. The need exists to develop a more accurate methodology.

2.4.5.4 Public Acceptance

Public acceptance of wastewater management alternatives will be closely related to the costs and inconvenience to homeowners and to public health implications.

The probable reaction of specific groups affected by each alternative may be suggested by examining the particular interests of each group. For example, commercial owners, including apartment and office building owners, will be likely to favor alternatives which remove the responsibility for wastewater disposal from them and place it with a public agency. Cost will probably be a secondary consideration to relief from wastewater treatment problems. Owners of existing package treatment plants will be likely to favor alternatives that will leave their operations intact, while not favoring those alternatives that would curtail their operation. Landowners with interest in residential, commercial, or industrial development will favor the alternatives which most greatly facilitate such development.

2.4.6 System Alternatives Selected for Detailed Evaluation

Traditionally detailed cost, implementability and environmental evaluations in the EIS process are reserved for the EPA's preferred alternative. Due to the nature of this study, in that there exists a wide variety of wastewater management components, four of the nine system alternatives were selected for more detailed evaluation. The detailed evaluation includes an estimation of annual costs to the users. Also included is a detailed environmental evaluation that addresses both primary and secondary impacts of the specific system alternatives.

As discussed previously, there is no No-Federal-Action alternative in this EIS Supplement because no federal funds are involved. The system alternatives consist of eight (8) centralized alternatives and one (1) decentralized alternative. Because the decentralized system, Alternative 9, is similar to the 1983 EIS's preferred alternative and because it has the lowest calculated present worth, it has been automatically selected as one of the four (4) alternatives to undergo detailed evaluation.

The selection of the three (3) centralized system alternatives is based on the evaluation and screening process presented in Sections 2.4.2 through 2.4.5. Below is a brief description of the screening as it applies to each system alternative. Those selected include System Alternatives 1, 2, and 7.

2.4.6.1 System Alternative 1: Treatment South, SE Agricultural and Golf Course Spray Irrigation

This system alternative is one of the selected alternatives. It has the lowest capital costs of all alternatives and the lowest present worth value of all centralized alternatives. Environmental impacts, though significant are minimized because the spray irrigation expansion includes areas adjacent to existing, successfully operating sprayfields. Golf courses would be irrigated only at specified times of the day when public exposure can be minimized. Implementability is also very high because the type of spray irrigation at the SE sprayfield expansion site would be an extension of the existing agricultural operation and the golf course irrigation would be integrated with the existing irrigation system.

2.4.6.2 System Alternative 2: Treatment South, SE Forest and Golf Course Spray Irrigation

This system, which is a variation of Alternative 1, is one of the selected alternatives. It has the second lowest capital costs of all alternatives and the second lowest present worth of all centralized alternatives. Environmental impacts, though significant, are minimized because the spray irrigation expansion includes areas adjacent to existing, successfully operated sprayfields and to golf courses that would irrigate only at specified times of the day when public exposure can be minimized. Implementability is lower than System Alternative 1 because operating a forest spray irrigation system, including harvesting is new to the operators of the existing, adjacent agricultural operation and the buried, spray irrigation system requires special construction. As is the case for System Alternative 1, the golf course irrigation component would be integrated with the existing irrigation system.

2.4.6.3 System Alternative 3: Treatment South, SE Artificial Wetlands and Golf Course Irrigation

This system is not a selected alternative. It has the third lowest capital costs, as does Alternative 7, but has a slightly higher operation and maintenance cost, which increases its present worth value. It is different from System Alternative 7 only in that it treats and disposes of the wastewater in the southeast areas and includes golf course irrigation. Since selected Alternatives 1 and 2 already address siting all wastewater management facilities in the south and using the golf courses, it was determined that this alternative not be included.

2.4.6.4 System Alternative 4: Treatment South, SE Artificial Wetlands

This alternative is not a selected alternative. It has the second highest capital costs and present worth value for all alternatives. It is a variation of Alternative 3 in that all treated effluent will be handled by artificial wetlands adjacent to the SE sprayfield.

2.4.6.5 System Alternative 5: Treatment North and South, SE and NE Spray Irrigation

This alternative is not a selected alternative. It has the fifth lowest capital costs and present worth value for all alternatives. Implementability is a problem because 1) the inconsistent soil characteristics in the NE require special design of the irrigation system to avoid adverse environmental impacts and 2) the prevalence of sensitive wetlands in the NE makes the use of spray irrigation a potential adverse environmental impact.

2.4.6.6 System Alternative 6: Treatment North and South, SE and NE Forest Spray Irrigation

This alternative is not a selected alternative. It has the highest capital cost and present worth value of all alternatives. Implementability is a problem because 1) the inconsistent soil characteristics in the NE require special design of the irrigation system to avoid adverse environmental impacts, 2) the prevalence of sensitive wetlands in the NE makes the use of spray irrigation a potential adverse environmental impact, and 3) the operation of the forest spray irrigation system is new to the operators of the existing agricultural operation.

2.4.6.7 System Alternative 7: Treatment North and South, SE and NE Artificial Wetlands

This alternative is a selected alternative. It has the third lowest capital costs of all alternatives, as does Alternative 3, but has a slightly lower operation and maintenance cost, which results in the third lowest present worth value for a centralized system. It is also included as one of the selected alternatives in order to include the detailed evaluation of a system with North and South Wastewater Management Sites which results in having the wastewater managed near the source. The environmental impact of artificial wetlands is low because of the inclusion of liners to be used in the wetland design and because of the relatively small land area requirements. Implementability is lower for this system than the spray irrigation alternatives because the use of artificial wetlands is a new and innovative technology which can result in some start-up difficulties.

2.4.6.8 System Alternative 8: Treatment North and South, SE Artificial Wetlands

This alternative is not a selected alternative. It has the fourth highest capital costs and present worth value for all alternatives.

2.4.6.9 Selected System Alternatives with Flow Reduction Measures

Table 2-26 summarizes the cost savings that could be realized if the flow reduction measures described in Section 2.2.4 are instituted. The flow reductions do not effect all components of a system alternative. Unaffected Components include the upgrading of the LBR Plant and the disposal components handling the LBR Plant's effluent (golf course irrigation). Generally, reducing the flow from 30.97 mgd to 29.75 mgd which is a 4% decrease, generates an average decrease of 14% in capital costs, 18% in annual O&M costs, and 15% in present worth costs.

CHAPTER 3
ALTERNATIVES EVALUATION

CHAPTER 3 ALTERNATIVES EVALUATION

3.1 COST AND IMPLEMENTABILITY EVALUATION

3.1.1 Cost Effectiveness

EPA requires that the alternative evaluation process include a cost-effectiveness analysis. The objective of a cost-effectiveness analysis, according to EPA regulations for the construction grants program (Code of Federal Regulations Title 40, Part 35, Appendix A), is to determine which wastewater management system alternative will meet federal, state, or local requirements in the minimum total resource cost over time. Furthermore, the most cost-effective alternative is defined as the system with the lowest present worth unless nonmonetary costs are overriding. The nonmonetary factors include primary and secondary environmental effects, implementation capability, operability, and performance reliability and flexibility. Even though no federal funds are involved in this study, it is still important to the users and potential users, and therefore to EPA, that the wastewater management system costs be reasonable for the users.

Tables 2.11 through 2.19 presented the estimated project costs for each of the system alternatives. These costs are used as a basis for the project cost analysis presented in Section 3.1.1.1 for the four (4) selected system alternatives. A discussion of financing options is included to determine sources of revenue for construction of an alternative, particularly the centralized alternatives. User charges for the four (4) alternatives were estimated to determine the financial impact of the proposed wastewater treatment and disposal services on the Tallahassee-Leon County area user households.

Although the system alternatives have been planned in some detail and every effort has been made to ensure that the costs of each alternative are reasonable, it should be recognized that uncertainty is inherent in any attempt to plan for the future. Indeed, with the level of detail used in a study like this one, error limits of 30 percent can be expected. The objective of the cost-effectiveness evaluation was not to define what the actual charge to the users of each system would be, but rather to develop costs that would be internally consistent and allow a valid comparison of alternatives.

3.1.1.1 Project Costs

3.1.1.1.1 System Alternative 1: Treatment South, SE Agricultural and Golf Course Spray Irrigation

The treatment components of Alternative 1 consist of improving the LBR Road Plant and improving and expanding the TPS Plant for a total capital cost of $15,665,000. The expanded conveyance system which is to transport collected sewage from new development to these plants is estimated to cost $52,586,000.

The effluent disposal system which includes expanding the existing SE Agricultural Spray Irrigation operations by 1,410 acres and using spray irrigation at four (4) golf courses is estimated to have a capital cost of $17,455,000. These costs include the $8,733,000 for conveying treated effluent to the disposal sites.

The total capital and annual O&M costs for Alternative 1 are estimated to be $85,706,000 and $3,659,000, respectively. These costs are summarized in Table 2.11.

3.1.1.1.2 System Alternative 2: Treatment South, SE Forest and Golf Course Spray Irrigation

The project costs for Alternative 2 are similar to those of Alternative 1 except for the effluent disposal system which includes expanding the existing SE disposal site by 1,475 acres, but using forest spray irrigation on these acres instead of agricultural spray irrigation. The total capital costs for the disposal components are $23,987,000 which include $8,733,000 for conveying treated effluent to the disposal sites.

The total capital and annual O&M costs for Alternative 2 are estimated to be $92,238,000 and $2,998,000, respectively. These costs are summarized in Table 2.12.

3.1.1.1.3 System Alternative 7: Treatment North and South, SE and NE Artificial Wetlands

The treatment components of Alternative 7 consist of improving and expanding the TPS Plant, and constructing a new NE Plant for a total capital cost of $26,309,000. The expanded conveyance system which is to transport collected sewage from new development to these plants is estimated to cost $36,207,000.

The effluent disposal system includes expanding the existing SE disposal site by 424 acres and developing a 580 acre NE disposal site. Disposal facilities at these sites include artificial wetlands and rapid infiltration basins. These facilities are estimated to have a capital cost of $35,805,000 which includes $4,226,000 for conveying treated effluent to the disposal sites.

The total capital and annual O&M costs for Alternative 7 are estimated to be $98,321,000 and $2,469,000, respectively. These costs are summarized in Table 2.17.

3.1.1.1.4 System Alternative 9: Decentralized

The project costs for Alternative 9 are summarized in Table 2.19 and includes costs for improving the LBR Plant, expanding the Killearn Lakes Plant, constructing on-lot systems using septic tanks and soil absorption fields or sand mounds, expanding effluent conveyance capacity from the TPS Plant to the SE disposal site, and expanding the existing SE Agricultural Spray Irrigation operations by 469 acres. Total capital costs are estimated to be $99,779,000 and the total annual O&M costs are estimated to be $1,540,000.

3.1.1.2 Financing Options

The annual household costs presented in the following section assumes, for the sake of comparison, that the City finances the centralized system alternatives using the sale of revenue bonds. In addition to this financing mechanism there are cost-sharing techniques including federal grants. The current status of the federal grant program is described below followed by a summary of municipal revenue bonds and privatization.

3.1.1.2.1 Federal Grants

Current EPA construction grant regulations provide for federal funding of 55 percent of the allowable costs of wastewater treatment projects started after September 30, 1984. However, such projects must appear on the State's priority list. Projects with the highest priority receive grants and then, if funds are available, the other projects are funded in descending order of priority. The priority list is assembled each year. It is expected that no grant funds will be available after 1990. To replace this lost funding source, EPA has assisted the states in establishing revolving loan fund programs. In any case, the costs in this study are presented assuming no grant participation.

3.1.1.2.2 Municipal Revenue Bonds

Revenue bonds are tax exempt debt instruments which are used to construct capital projects and are retired by payments from user charges collected by the City.

The tax exempt status of municipal revenue bonds will not be affected by new tax laws. However, the traditional purchasers of municipal revenue bonds (large banks, insurance companies and retirement funds) will be restricted as to the amount of tax exempt securities that they purchase. Therefore, the cost of selling municipal revenue bonds and the interest rates paid may increase.

Another issue affecting the use of municipal revenue bonds by the City for construction projects in Leon County is debt service coverage. Debt service coverage is expressed as a multiplier or percentage of net revenue. In order for the City to sell revenue bonds, it will have to demonstrate that it generates a net revenue approximately 1.1 times its annual debt.

3.1.1.2.3 Privatization

Privatization is a concept that has been created as a result of the emphasis by local, state and federal governments to reduce the deficit and any grant-in-aid programs. Under this approach, a private firm could be contracted to design, finance, construct, own and operate facilities.

Privatization is not intended to be synonymous with a single financing approach. Privatization applies to the range of techniques which a public agency may utilize in order to engage private companies in the solution to its problems. It can apply to: municipal leasing, wherein no tax benefits arising from ownership are intended to be realized; the creative sale of future user rights as a basis of security for future purchases; the development and application of the infrastructure bank concept; and a system of revolving, repayable grants. It can also apply to other creative concepts not yet formulated.

3.1.1.3 Annual Household Costs

For evaluation purposes, user charges are defined as the average total annual household costs for the wastewater management system. This average annual cost is a weighted average of costs for the existing sewered, existing unsewered to be served, and future households to be served.

3.1.1.3.1 Household Characteristics

Table 3-1 presents the household projections by service area for the Tallahassee-Leon County study area. Using the 1980 census household statistics, the service areas' average household sizes (persons per household) were determined. Generally, the areas on the outskirts and outside of the City tend to have larger households. Since most of the development is occurring at these locations, particularly in areas north of the center of the City, the overall study area's household size increases slightly for the design years.

As stated previously the objective of calculating annual household costs is not to define what the actual user charges of each system will be, but rather to develop costs that would be used to provide a valid comparison of alternatives. In addition, the calculation of the average annual payment is necessary to determine whether a project is too expensive by EPA guidelines. The EPA considers wastewater management projects to be expensive when the average annual household cost exceeds the following percentages of median annual household income (values were adjusted using the U.S. Department of Labor Consumer Price Index to reflect 1989 dollars):

- 1.0 percent when the service area's median income is less than $15,000,
- 1.5 percent when the service area's median income is between $15,000 and $26,000; and
- 1.75 percent when the service area's median income is greater than $26,000.

Table 3-2 lists the estimated 1989 median household income for the service areas along with the calculated maximum annual household cost as recommended by EPA.

The total annual household costs calculated for this EIS Supplement consist of three components: annual debt payment, annual assessment payments, and annual operating, maintenance, and replacement costs. These cost components and the assumptions used to calculate their values are described below. The costs estimates assume no federal grant funding.

3.1.1.3.2 Annual Debt Payment

For the purpose of this cost-effectiveness evaluation, it is assumed that the City would float one revenue bond to raise capital funds to cover the costs of facility planning, design, and construction for a centralized system. The bond would be amortized over a 20-year period at an

Table 3-1

HOUSEHOLD PROJECTIONS BY SERVICE AREA

		CENTRALIZED SEWERED HOUSEHOLDS				UNSEWERED HOUSEHOLDS (1),(2)				TOTAL HOUSEHOLDS			
Service Area	Household Size (Persons/HH)	1987	1990	2000	2010	1987	1990	2000	2010	1987	1990	2000	2010
Lake Bradford Road	2.03	18,038	17,987	17,957	17,952	0	0	0	0	18,038	17,987	17,957	17,952
P.S. No. 12	2.57	12,199	14,479	18,870	21,506	5,228	3,620	2,097	1,132	17,428	18,099	20,967	22,638
Riggins Road	2.76	6,447	7,276	8,355	10,723	0	0	0	0	6,447	7,276	8,355	10,723
Northeast	3.15	1,951	2,562	3,935	5,377	2,211	2,479	2,689	2,663	4,133	5,041	6,624	8,040
Springhill Rd	2.70	8,997	9,507	10,449	11,269	0	0	0	0	8,997	9,507	10,449	11,269
T.P. Smith	2.80	178	371	549	696	534	371	235	174	712	742	784	870
Southeast	2.66	212	594	840	1,796	2,711	2,815	4,849	6,554	2,923	3,409	5,689	8,350
Buck Lake	3.03	146	333	964	3,036	1,312	1,333	1,446	759	1,458	1,666	2,409	3,795
Totals		48,168	53,109	61,919	72,355	11,996	10,618	11,316	11,282	60,136	63,727	73,234	83,637
Average Household Size		2.44	2.47	2.51	2.55	2.76	2.80	2.81	2.79	2.51	2.52	2.55	2.58

(1) Includes households using on-lot and small community wastewater treatment and disposal facilities.

(2) Based on service percentages provided in the City MSP, Table 4.1-B.

Table 3-2

ESTIMATED MEDIAN ANNUAL HOUSEHOLD INCOMES AND EPA RECOMMENDED MAXIMUM COSTS (1989 DOLLARS)

Service Area	Median Annual Household Income (1)	Maximum Annual Household Cost (2)
Lake Bradford Road	11,200	$ 112
P.S. No. 12	24,600	369
Riggins Road	32,400	567
Northeast	43,000	753
Springhill Road	15,900	239
T.P. Smith	20,700	311
Southeast	24,700	371
Buck Lake	36,800	644
Service Area-wide	24,000	360
City-wide	17,900	269
County-wide	21,900	329

(1) Based on data from the 1980 Census of Population and Housing of the U.S. Department of Commerce and the Consumer Price Index (all urban consumers, U.S. City average, all items) of the U.S. Department of Labor.

(2) Calculated maximum allowable costs for wastewater management systems.

interest rate of 9 percent. Therefore, the annual debt payment is the capital recovery factor, 0.10955, times the bond amount which is the total project cost. Table 3-3 displays the debt payment calculation for the three (3) selected centralized alternatives plus the modified version of Alternative 7.

Generally, it is assumed that the costs for area systems, such as those proposed in Alternative 9, the decentralized alternative, will be paid for by the developers who, in turn, will recover them as part of the selling price of the house or other types of structures. Therefore, the cost for on-lot systems will be a part of the selling price of a new house or a structure not connected to either an area system or a large centralized system. To account for these "hidden" costs in the cost-effectiveness analysis, it was assumed that the capital costs for area and on-lot systems would be amortized over a 30-year period at a 9.5 percent interest rate, based on a typical 1989 market rate for first mortgages (capital recovery factor = 0.10168). The annual debt payments for those future households of Alternative 9 are presented in Table 3-5, for "expansion areas".

3.1.1.3.3 Annual Operating, Maintenance, and Replacement Costs

This component includes annual costs for operating, maintaining and replacing "perishable" equipment (defined below). The annual replacement cost is the yearly investment over a 20-year period (the assumed life of the "perishable" parts of the facility) at a fixed rate of return, required to pay the replacement cost at the end of the 20-year period. In actuality, the service provider may choose to finance equipment replacement at the time of purchase rather than establish a replacement fund as illustrated here. The replacement costs are included in the annual cost for this analysis to maximize the household cost and provide a "worst-case" comparison against EPA's expensiveness criteria. The interest rate used for the fixed rate of return is 8-7/8 percent which is the current interest rate used by EPA for present worth analysis.

Estimates for replacement costs assumed equipment (perishable parts) consisted of the following:

- One hundred percent of the treatment plant electrical; heating, ventilation and air conditioning (HVAC), instrumentation, and piping components;

- Ten percent of the treatment plant major structures (appurtenances and process equipment); and

- Ten percent of both the sewer line components (both collectors and interceptors) and the major components of the conveyance pumps.

Table 3-4 lists the estimated average annual household costs for operation, maintenance, and replacement (OM&R) and the breakdown of these costs of facility components. Replacement costs are not included in the annual O&M costs for on-lot and area systems because all "parts" are assumed to last the service life of the system provided proper maintenance procedures are followed. The annual O&M costs for area systems and on-lot systems for Alternative 9 are included in Table 3-5.

Table 3-3

CALCULATION OF DEBT PAYMENT FOR SEWERED POPULATION
(Thousands of 1989 Dollars)

	Selected Alternatives			
	1	2	7	9 (3)
Project Cost	85,706	92,238	98,278	4,343
Annual Debt Payment	9,389	10,105	10,766	476
Average Household Annual Household Debt Payment (Dollars)	130 (1)	140 (1)	149 (1)	9 (2)

(1) Assumes a service area of 72,355 households in the year 2010.

(2) Assumes a service area of 54,256 households in the year 2010.

(3) Excludes the on-lot systems proposed to serve future populations.

Table 3-4

ESTIMATED ANNUAL OM&R COSTS
(Thousands of 1989 Dollars)

	Selected Alternatives			
	1	2	7	9 (3)
Conveyance O&M	404	404	333	-
R	439	439	302	-
Treatment O&M	2,010	2,010	1,098	94
R	399	399	540	6
Disposal Conveyance				
O&M	122	122	72	22
R	73	73	35	14
Disposal O&M	1,123	462	966	349
R	72	125	205	15
Total	4,642	4,034	3,551	500
Average Annual Household Cost (Dollars)	64 (1)	56 (1)	49 (1)	9 (2)

(1) Assumes a service area of 72,355 households in the year 2010.

(2) Assumes a service area of 54,256 households in the year 2010.

(3) Excludes the on-lot systems proposed to serve future populations.

Table 3-5
ESTIMATED ANNUAL HOUSEHOLD COSTS
(in Third Quarter 1989 Dollars)

	Selected Alternatives			
	1	2	7	9
Annual Debt Payment for Treatment & Interceptor				
Existing Sewered Areas	130	140	149	9
Future Infilling	130	140	149	9
Future Expansion				
Centralized	130	140	149	0
On-lot	0	0	0	540
Area	0	0	0	410
Annual OM&R Cost for Treatment and Conveyance				
Existing Sewered Areas	64	56	49	9
Future Infilling	64	56	49	9
Future Expansion				
Centralized	64	56	49	0
On-lot	0	0	0	52
Area	0	0	0	291
Assessment for Collection System				
Existing Sewered Areas	0	0	0	0
Future Infilling	0	0	0	0
Future Expansion				
Centralized	831	831	831	0
On-lot	0	0	0	0
Area	0	0	0	831
Total Annual Payment				
Existing Sewered Areas	194	196	198	18
Future Infilling	194	196	198	18
Future Expansion				
Centralized	1025	1027	1029	0
On-lot	0	0	0	592
Area	0	0	0	1532
Average Annual Payment (1)	270	272	274	168

EPA Maximum Annual Household Cost for Service Area = 360

(1) Weighted average of the existing sewered, existing unsewered to be served, and future households to be served. Values used are:

	Alternatives 1, 2, and 7	Alternative 9
Existing Sewered	48,168	48,168
Future Infilling	17,605	6,088
Future Expansion		
Centralized	6,582	0
On-lot	0	17,569
Area	0	530
Total	72,355	72,355

3.1.1.3.4 Assessment

For this analysis it is assumed that the City would finance the construction of collection systems for the existing unsewered expansion areas by assessment of costs against benefited properties. The estimated average per-household cost of collection systems, including house connection, is $8,180 in 1989 dollars. Assuming a 9.5 percent interest rate, based on a typical 1989 market rate for first mortgages, a 30-year loan for $8,180 would have annual payments of $831. For the purpose of this evaluation, the annual household cost for households in expansion areas includes the $831 yearly assessment cost. The cost of collectors for these households is likely to be a part of the price of the house and would be included in the mortgage amount. Unsewered households in "infill" areas do not incur significant costs for collection and therefore do not have cost included here.

3.1.1.3.5 Total Annual Cost

The total annual household costs for system customers are shown in Table 3-5. The average total annual payment is a weighted average of the existing sewered, future infilling, future expansion, and future on-lot households. The range of average annual payment is from $149 (for Alternative 9) to $274 (for Alternative 7). Table 3-2 listed the median annual household income for the Leon County Area which resulted in a recommended maximum household cost for wastewater management of $360. All alternative systems are within this level. It should be noted that any large centralized system will be done in phases and should lessen the burden on existing, sewered households.

3.1.2 Implementability

The engineering and technical expertise necessary to implement the selected alternatives are well established and available. To a large extent, implementability would be determined by public acceptance, public agency approval, and City and County selection. Based on input from the public participation programs undertaken by the EIS, the following conclusion can be made:

1. Low annual costs to households are preferred and it is generally assumed that the project will not receive federal grant funds. The Leon County Board of Commissions has established as their Goal Number 4, for development of services in the unincorporated area of the County - Provide water and sewer services at lowest possible costs.

2. Distribution of costs is a major concern to many citizens and should be based on use. Generally, centralized wastewater management system costs are spread over all utility customers beginning when facilities are added. Consequently, the capital cost of carrying significant amounts of over-capacity would have to be borne by

existing customers until new customers connected to the system and the facility reached user capacity. On the other hand, most of the costs of on-site facilities (a decentralized system) would be incurred by the user leaving a small balance to be passed on to the public, i.e. equitable cost allocation. Also, on-site facility costs would be incurred simultaneously with the need for the facilities resulting in a more efficient use of invested capital.

3. Compatibility of management system with existing land use is a major concern to many citizens. The Leon County Board of Commissioners has established as their Goal Number 1 for development of services in the unincorporated area of the County - Manage the impact of growth.

4. A management system that is flexible to meet the changing needs of a developing area and that increases the availability of sewer management systems is preferred. The Leon County Board of Commissioners has established as their Goal Number 2 for development of services in the unincorporated are of the County - Increase ability to respond to citizens needs.

5. A management system that simplifies the procedures needed to monitor the operations and maintenance of a system is desirable to ensure that the system functions properly. The Leon County Board of Commissioners has established as their Goal Number 3 for development of services in the unincorporated area of the County - Develop tools for managing services.

6. The City prefers expansion of the T. P. Smith Facility to 27.5 MGD and expansion of the Southeast Agricultural Spray Irrigation operations to handle the additional effluent. These expansions have already been made a part of the City's 5-year capital budget and design of some of the components has already been completed.

7. Citizens of southwestern Leon County (Munson Area Preservation, Inc.) oppose expanding treatment and disposal facilities in the south to accept wastewater from development in the north, particularly the northeastern areas of the County.

8. Citizens of southwestern Leon County (Munson Area Preservation, Inc.) expressed concerns over the environmental impact of effluent spray irrigation operations. Specific concerns include groundwater contamination and transmittal of disease by spray aerosols and animal vectors. Citizens of Springhill Road expressed concern over the limited ability of sprayfield crops (forests or agricultural) to absorb pollutants during periods of germination and during times of inactivity when the field is left fallow such as in the winter season. Also people are concerned with the potential for ponding in saturated or unsuitable soils.

9. Citizens of Springhill Road expressed doubt regarding the successful use of artificial wetlands citing the failure of Lake Jackson's artificial wetlands to prevent pollution of the lake, the high percolation rates of SW Kershaw sands in the area, and the limited growing season for bulrushes (approximately 6 months of the year).

10. Failure of on-lot systems is a concern to the County and the City. Many citizens believe on-lot system failures are due to poor location and are not inherent in the design of septic tanks and soil absorption fields.

11. Non-source pollution resulting primarily from stormwater runoff has been a growing concern to the public in that it contributes to the fouling of surface and ground waters. Uncontrolled runoff from agricultural sites and malfunctioning on-lot systems are primary issues.

Table 3-6 presents a simple rating of the selected alternatives for implementability based on the above information. It should be noted that this implementability analysis does not account for a "weighting" of the implementation characteristics, in that all characteristics are considered of equal importance. From this table centralized Alternatives 1, 2, and 7 have a slight advantage in regards to potential implementability over the decentralized alternative, Alternative 9.

3.1.3 Reliability

Reliability is the degree to which a wastewater treatment system consistently achieves and maintains effluent limits for which the system was designed. The general consensus is that larger centralized treatment facilities are more reliable than smaller area facilities. Experience suggests that the duration of malfunctions resulting in violations would be greater at small treatment plants because of limited operational flexibility and less frequent inspection and maintenance. The frequency of malfunctions at large plants may not be less than at small plants, but the ability to identify, isolate, and correct a malfunctioning unit at a large plant would reduce the probability of unacceptable discharges.

To provide a method for evaluating the reliability of the selected alternatives in this cost-effectiveness analysis, the characteristics that effect a system's reliability have been defined as follows:

1. On-site personnel - provides timely response to problems that may occur at treatment and disposal facilities including equipment failure and wet-weather wash-outs.

2. Large operating budget - allows facility to attract and pay higher-caliber supervisory personnel and more competent operators.

Table 3-6
IMPLEMENTABILITY ANALYSIS RATING

Implementation (1) Characteristics	Selected Alternatives 1	2	7	9
1. Low annual household costs	2	2	2	3
2. Equitable distribution of costs	2	2	2	3
3. Compatible with existing land use	2	3	1	2
4. Able to respond to the needs of development	3	3	3	1
5. Provides easy management of facilities	3	3	2	1
6. City's approval	3	2	2	1
7. Treatment and disposal of wastewater near generation site	1	1	3	3
8. Reduce potential environmental impact due to spray irrigation of effluent	1	1	3	3
9. Reduce potential operation failure of artificial wetlands	3	3	1	3
10. Reduce on-lot system failures	3	3	3	1
11. Minimize non-source pollution	2	2	2	1
Total	25	25	25	22
Average	2.27	2.27	2.27	2
Ranking (2)	4	4	4	3

(1) Rating scale is as follows:
1 Low implementation potential.
2 Medium/conditional implementation potential.
3 High implementation potential.

(2) Ranking goes from least implementable (=1) to most implementable (=4). When a tie exists, both alternatives are assigned the same numerical ranking.

3. Maintenance program - A structured program provides a systematic approach to performing maintenance tasks including routine and emergency tasks. This ensures they are done correctly and in a timely fashion to minimize downtime and both operation and maintenance costs.

4. Equipment redundancy and spare capacity - provides for equipment failure and flow variations and includes standby generators, standby treatment units, and flow equalization basins.

5. Length of sewer - the longer the sewer collection/interceptor system the more susceptible it is to inflow and infiltration problems.

6. Number of pumps and force mains in sewer system - the more pumps and force mains in a sewer collection/interceptor system the more susceptible it is to have mechanical problems.

7. Complexity of facility's technology and hardware - the more complex a system is the more susceptible it is to breakdowns with longer downtimes required to determine and correct reason for failure.

8. Experience in using technology - the more experience in using a particular technology the less likely a facility with this technology will experience operation problems and failure and the more rapidly a breakdown can be corrected. Likewise a new and innovative technology with little test cases may experience more operation problems.

These characteristics are summarized and rated in Table 3-7. It should be noted that this reliability analysis does not account for a "weighting" of the reliability characteristics, in that all the characteristics are considered of equal importance. The ratings listed in the table are based on the following assumptions:

1. The City will operate any centralized facilities. Therefore, they will supply supervisory personnel and operators for these components.

2. TECO will operate any area facilities. Therefore, they will supply supervisory personnel and operators for these components.

3. Treated effluent for all alternatives will be disposed of via some type of land application.

From the table, Alternative 1 with its expansion of the T. P. Smith Facility and the SE Agricultural Spray Irrigation Operations, has an advantage over the other alternatives. When it comes to reliability, none of the remaining alternatives stands out as any less reliable than the others.

Table 3-7

RELIABILITY ANALYSES RATING

System Characteristic (1)	Selected Alternatives			
	1	2	7	9
1. On-Site Personnel	3	3	3	1
2. Large Operating Budget	3	3	3	1
3. Structured Maintenance Program	3	3	3	1
4. Equipment Redundancy	3	2	2	1
5. Length of Sewer	1	1	2	3
6. Number of Pumps in Sewer System	1	1	1	3
7. Complexity of Technology and Hardware	2	2	1	3
8. Experience in Using Technology	3	2	1	3
Total	19	17	16	16
Average	2.38	2.13	2.00	2.00
Ranking (2)	4	3	2	2

(1) Rating scale is as follows:

1 - Poor reliability

2 - Average or conditional reliability

3 - Good reliability

(2) Ranking goes from least reliable (=1) to most reliable (=4). When a tie exists, both alternatives are assigned the same numerical rankings

3.2 ENVIRONMENTAL EVALUATION

The environmental impacts caused by the four (4) selected alternatives (1,2,7,and 9) were categorized as primary and secondary. Primary impacts are characterized as being directly affected by the implementation of the wastewater management system. Secondary impacts occur as indirect results of system implementation.

3.2.1 Primary Impacts

3.2.1.1 Surface Water Resources

Surface water degradation may occur as a direct result construction activities or during the effluent disposal process. Each of the four (4) alternatives involve the construction of conveyance pipelines, but little impact on surface waters is anticipated due to the use of existing rights of way. There may be areas when an existing right of way cannot be used, but adequate erosion and sedimentation control measures should protect adjacent surface waters.

The application of effluent on golf courses, as planne Alternatives 1 and 2, will not likely impact surface water resources. The position, trajectory, and area coverage of sprinkler systems should be designed to avoid direct application to surface waters. Application of effluent on golf courses may actually improve the water quality of local resources because the use of effluent reduces the use of chemical fertilizer, a major nonpoint pollution sources.

Agricultural and forest spray application could cause if systems are constructed in areas having low infiltration/percolation rates, or where the application rate exceeds the intake capability of the soil. The SE agricultural and forest spray sites are located adjacent to the existing SE agricultural irrigation facility. Portions of these sites are wetlands and drain into numerous karst depressions, as well as Shepherd Branch and Chicken Branch. Clearly, there is an opportunity for degradation of surface waters by spray irrigation systems used in Alternatives 1 and 2. Careful design and orientation must be used if these sites are to be adapted to land application facilities.

The use of artificial wetlands and rapid infiltration the NE and SE sites will not likely result in degradation of surface waters, unless the formation of a sinkhole occurs. There are numerous sinkholes, karst depressions, lakes, streams, and wetlands within the sites, but surface water problems should be avoided by using proper care in design and location of these facilities. Rapid infiltration basins are designed to avoid surface water runoff, and when used in conjunction with artificial wetlands, should not cause significant surface water impacts.

There will be an increase in surface water flow due to the operation of any of the alternatives. The increase will likely occur due to groundwater mounding and the subsequent movement into the adjacent surface water bodies. No significant impacts due to increased surface water flows are anticipated.

3.2.1.2 Groundwater Resources

Groundwater quantity and quality will most likely be affected by any of the land application or infiltration systems. Wastewater constituents not used by plants, degraded by microorganisms, or fixed in the soil may leach to the groundwater. Constituents of concern are bacteria, viruses, nitrate-nitrogen, heavy metals, phosphorous, and organics.

Sites using slow-rate land application techniques pose a minimal bacterial contamination threat to the groundwater. The combination of high bacterial densities and a high water table should be avoided even when using a slow-rate technique to prevent undesirable surface seepage. High-rate land application techniques, such as rapid infiltration, may experience penetration of bacteria about 10 meters vertically and at variable distances laterally.

In the study area, the predominant soil types generally feature a fine-textured sand with moderate to moderately-rapid permeabilities. The predominant soils at the Northeast sites are the Orangeburg and Lucy soil series with favorable pathogen and other pollutant removal characteristics. The predominant Kershaw soil series in the Southeast is characterized by coarsely-textured sand which is suitable for slow rate application but unfavorable for rapid infiltration (high rate application) because of possible inadequate wastewater renovation before percolation to the groundwater aquifer. Data collected from selected monitoring wells near the City's existing sprayfields indicate an increase in chloride and nitrate-nitrogen concentrations. Chloride levels at the SE Sprayfield increased from a background concentration of 3 mg/l to 20 mg/l and nitrate-nitrogen concentrations increased from 0.5 mg/l to 4.0 mg/l. The standard for class G-II groundwaters (public drinking water supply) as established by FDER is 250 mg/l for chlorides and 10 mg/l for nitrate-nitrogen, therefore the wastewater appears to be renovated properly.

Groundwater levels are likely to be affected to a greater extent than quality. Application by any of these methods, whether by agricultural or forest spray, golf course spray, rapid infiltration basins, or on-lot systems, will cause local groundwater mounding. The additional wastewater will cause greater recharge to the Floridan Aquifer as well as increased baseflow to the lakes, streams, wetlands and karst depressions. This increase in flow is not likely to cause significant distortion of the regional pattern of groundwater movement or surface waters.

3.2.1.3 Ecological Resources

Any site development will significantly alter existing terrestrial ecosystems. The County possesses several ecologically-sensitive and threatened or endangered species which are likely to be affected by any of the system alternatives. For example, there are 26 species or groups of plants in the County which are protected by Florida law as threatened or endangered. Nine amphibians and reptiles, eleven bird species, 29 mammals, one specie of fish, and two invertebrate types in the County are also protected by Florida law. Even if no threatened or endangered individuals are lost during construction of these facilities, it is the permanent alteration of a habitat which will cause population reductions. This is particularly true for the Gopher Frog (Rana areolata aesopus) because this threatened amphibian is known to migrate over long distances, and is dependent on the gopher tortoise burrow for protection. There is documented evidence of gopher frogs migrating 1.2 miles (Herpetological Review, 1988) in order to reach shallow breeding ponds. Consequently, if migratory paths are disturbed, the gopher frog's breeding may be curcumvented. In addition, the loss of the gopher tortoise habitat is a concern. If the gopher tortoise is driven out of its current range, the threatened gopher frog is certain to be lost as well.

In addition to threatened or endangered plant and animal species, the existing ecosystems at the proposed SE and NE Sprayfields will experience impacts in some or all of the following categories: species diversity, breeding grounds, food chain integrity, degree of naturalness, degree of the replaceability of community, ecosystem uniqueness and fragility, interaction with other ecosystems, and wetlands.

It is important to consider the size of the land areas which are potentially impacted by proposed construction and operation. Based on recent work by the County Public Works, the SE Sprayfield sites are less environmentally sensitive than the NE site, but the land areas required at these sites are vastly different, and merit careful review. The SE agricultural and forest spray sites of Alternative 1 and 2, respectively, require approximately 1450 acres, but the artificial wetlands and rapid infiltration basins of Alternative 7 need only 1000 acres. These 1000 acres would be divided between the NE site (580 acres) and the SE site (420 acres). The larger land area specified for the NE site is required because the flow to be treated at the NE Plant (5.2 mgd) is greater than the additional flow to be treated by the TPS Plant (1.3 mgd).

The general health of an ecosystem usually has a strong negative correlation with the amount of human intervention and a strong positive correlation with undisturbed land area. Land disturbance and increased human management intensity on any of these proposed sites will result in site degradation. This would be especially true where both the NE and SE disposal sites are developed as proposed for Alternative 7. It must be understood, however, that no matter which alternative is chosen, further loss of habitat and ecosystem destruction will take place due to residential and commercial development. Regardless of which alternative is chosen, measures must be taken to reduce the impacts of construction and operation on existing plant and animal communities.

3.2.1.4 Floodplains and Wetlands

Wetlands at the SE sites are of good to high quality. Any use of agricultural or forest spray facilities should be located carefully to avoid direct and harmful contact with wetlands. Because the sprayfields proper will be located on uplands with appropriate evergreen buffer zones, impacts on wetlands should be minor.

Floodplains along the St. Marks Lowlands include marshes and outstanding quality mature cypress-gum swamps. It is conceivable that surface water quality could be degraded during operation of the spray facilities, but impacts to the floodplains due to quality degradation should be reduced or eliminated by proper location and design of the facilities. It is not anticipated that major structures will be built within floodplains at the NE or SE sites.

3.2.1.5 Archeological, Historical, and Recreational Resources

There are no known archeological or historical resources within the proposed sites. If resources of this kind are found during construction, work on the site would be stopped to allow for evaluation and, if required, proper excavation and removal of the materials.

Recreation resources are plentiful in and around the numerous ponds and small lakes in the SE site. Fishing and boating are common in this area, but these would probably not be affected by spray facilities. The recreational use of forested lands of the proposed disposal sites would be diminished not only if it was developed for agricultural spray irrigation but also if a forest spray facility was established. Hiking, hunting, and similar outdoor activities would be restricted from the irrigated forest sites for public health reasons. The only downtimes for irrigation are expected to be during wet-weather conditions and harvesting which would also require restricted public access. Negative effects are not anticipated on the four proposed golf course sites. Irrigation of golf courses using wastewater effluent is a proven, non-obtrusive practice in other areas, and should be a benefit in the Tallahassee area, especially with respect to non-point source pollution.

3.2.1.6 Noise, Odor, and Air Quality

Construction of the conveyance lines will produce a temporary increase in noise and odors, as well as some local reduction in air quality. The use of diesel-powered and gasoline-fueled equipment will be the major contributors to the noise, odor, and air quality short-term impacts.

A greater short-term impact will occur at the NE plant construction site. Excavation and materials transport will cause some annoyance and disturbance to local residents and wildlife. These potential impacts may be reduced by the appropriate use of mitigative measures (see Section 3.3).

Noise, odors, and air quality are not anticipated to be problems at the agricultural or forest spray irrigation sites. Proper pretreatment of wastewater effluent will eliminate odor nuisances. There will be some low level noise associated with the continuous operation of the NE plant. The local impacts, however, may be significantly reduced by the use of buffer zones, planted in evergreen tree specie.

Golf course spray irrigation has a potential for causing a localized increase in airborne pathogens carried via aerosols. Proper treatment of the wastewaters and selective operation times should minimize this impact.

On-lot systems will not cause significant odor problems unless there are malfunctions resulting from poor planning or design. This includes undersizing the system and constructing the system on improper soil types or over a high water table.

3.2.2 Secondary Impacts

3.2.2.1 Land Use

Existing land use will be most altered at the disposal locations. Because of the use of existing rights of way, conveyance pipeline construction will not create changes in land use. The installation of spray irrigation systems, artificial wetlands, rapid infiltration basins, and the NE plant will create significant land use changes. Much of the proposed disposal sites in the SE are currently used as silvicultural operations in sand pine and slash pine. The NE site has uplands characterized by a mixture of cultivated crop and pasture, mature oak-pine-hickory forest, mature live oak forest, successional pines and hardwoods, old-field pine forest, and pine plantation. A transition to artificial wetlands and rapid infiltration basins will constitute significant land use alterations unless located in areas which are currently similar to the proposed use.

At the SE disposal sites, intensive or semi-intensive silvicultural activities will likely continue, but several low-density residential subdivisions already exist near the east parcel. The proximity of lakes and the St. Marks River system make the SE disposal site a prime target for future residential development.

The NE plant site and the artificial wetlands and rapid infiltration basins are proposed to be located in an area that includes the Welaunee Plantation and other developable parcels. Some smaller parcels in this area have recently become active residential subdivisions. Current plans at Welaunee Plantation are for a mixed commercial/residential development. Use as a sprayfield or artificial wetlands would almost certainly create much less impact on the canopy roads than commercial and residential development. The canopy roads are considered a valuable and virtually irreplaceable resource.

The predominant use of septic tank/drainfield systems under the on-lot alternative would require larger lot sizes and larger cleared areas in order to accommodate drainage fields. This could lead to more acres being converted to residential land use.

3.2.2.2 Economics and Employment

The location of industrial, commercial, and residential development is often influenced by the availability and extent of public services. The availability of public wastewater facilities in the NE region would make the area more attractive for future development, possibly resulting in more numerous and diverse employment opportunities. The construction of any of the alternatives will also create at least a short-term economic and employment boost, especially if local contractors are selected.

3.2.2.3 Transportation

Transportation resources are not likely to be affected to any great extent. In short-term, additional construction vehicles may create traffic bottlenecks, and a certain amount of temporary dirt and dust are likely to annoy some drivers. Long-term transportation could be affected if the increased wastewater facilities create large increases in local populations and hence greater traffic congestion.

3.2.2.4 Community Services and Facilities

Growth and development served by expanded sewer service has the potential to cause a need for increased public facilities such as fire and police, health, recreation, education, library facilities and utilities. The NE site could have a particularly strong effect on local expansion and associated community services. The NE site is one of the few remaining undeveloped areas to the northeast of Tallahassee. Construction of the NE Plant would have a significant effect on local development because it would allow for further expansion of residential and commercial property. The land application disposal sites themselves, whether in the southeast or northeast will require relatively large land areas which decrease the land area available for residential or commercial development.

3.2.2.5 Water Quality

Water quality at any of the sites should not be adversely affected, given the proper maintenance and operation of the treatment and disposal systems. On-lot systems, however, present a scenario where surface and groundwater quality could be degraded. On-lot systems failures have already been reported to the north of Tallahassee. It is essential to place a reliable monitoring system around the on-lot areas so that immediate detection of water quality degradation could be made.

Expansion of wastewater facilities has potential to increase the level and density of local population and residential development. The associated increase in traffic could cause a rise in petroleum oils and various other chemical materials washed from roadways. These chemicals could make their way via overland routes into surface waters, or move directly into the groundwater. In addition, increased residential development generally produces increases in the use of lawn fertilizer and pesticides. This in turn usually leads to pollution of stormwater runoff flowing to surface waters or to the direct pollution of groundwater.

3.2.2.6 Ecological Resources

Secondary impacts to ecological resources are often difficult to quantify. Adverse impacts will result primarily from the direct effect of wastewater application, and the indirect impact of habitat removal caused by growth and development. Other secondary concerns are: 1) the production of new sinkholes, or deepening of existing ones due to additional water entering the groundwater from land application and rapid infiltration basin; 2) the creation of a nutrient imbalance within ecosystems receiving spray effluent; and 3) the alteration of forested or agricultural systems because of the varied abilities of different plant species to adapt to the introduced conditions.

3.2.2.7 Environmentally Significant Agricultural Lands

There will be some conversion of agricultural and silvicultural land to spray irrigation facilities, wetlands, rapid infiltration basins, and the NE Plant. The NE site has substantial amounts of open agricultural land. The SE sites are mainly privately-owned lands currently left idle. There is also a relatively new concern over the impacts of global warming due to deforestation. The forest acts to remove carbon dioxide, a major contributor to the greenhouse effect, from the atmosphere. (Deforestation of lands in North America is no different than deforestation in Brazil). Deforestation will increase the rate at which the greenhouse effect warms the atmosphere. Every attempt should be made to avoid forest destruction in conjunction with any of the alternatives studied here.

3.2.2.8 Archeological, Historical, and Recreational Resources

Archeological resources could be damaged or destroyed by construction activities associated with future land development. Major archeological sites are most likely to exist near large or permanent water sources. Well developed floodplains and terraces will be the most sensitive areas.

Historical resources are not anticipated to receive direct damage or natural setting disruption. Future development may cause encroachment on these resources, and proper protection should be enforced when that need arises.

An increase in population due to increased sewer service will affect the way local recreational resources are used. City and County parks will receive greater visitor pressure, as will areas that support fishing and boating. It is hoped that the City and the County will plan appropriately for future anticipated growth. Parks and open spaces are important cultural resources, and should be planned with the use of adequate foresight.

3.2.3 Alternatives Impacts Summary

Environmental damage occurs whenever and wherever man-made development occurs. An ecosystem does not have to be paved and built on to be destroyed or reduced in its natural quality. Obviously, by utilizing existing rights-of-way for conveyance pipelines, and golf courses for effluent irrigation (disposal), additional environmental damage can be avoided. However, the four (4) golf courses can only dispose of 3.0 mgd. The remaining wastewater must be disposed of by agricultural spray irrigation, forest spray irrigation, artificial wetlands with rapid infiltration basins, or on-lot systems.

None of the alternative disposal methods pose severe environmental threats. The pretreatment of the wastewater will eliminate serious health threat potential. The introduction of additional wastewater to these ecosystems will probably not create major surface or groundwater problems, and existing nutrient balances should not change, so long as the disposal systems work as designed.

Each of the alternatives will create groundwater mounding, and could increase channel flows in nearby streams. With proper treatment and buffer areas, this is not considered a serious problem.

Damage to floodplains, wetlands, and archeological, historical and recreational resources should be minimal, and can be avoided if proper planning and design are applied.

The primary environmental concern is the impact on ecological resources. Man-induced changes, due to implementation of any of the alternatives, will surely affect the ability of the ecosystem to perform normally. The following points should be key in choosing an alternative:

1) Agricultural and forest spray irrigation are proven disposal methods, but require a relatively large land area.

2) Artificial wetlands and rapid infiltration basins are also fairly well proven, and require less land area.

3) NPDES permits are not available for artificial wetland wastewater discharges and no wastewater discharges are permitted to flow into Lake Lafayette.

4) The construction and operation of the NE Plant will produce a relatively large impact because of the permanent loss of that land area. By comparison, the disposal options, such as artificial wetlands, may be used by wildlife after construction is completed.

5) Golf course spray irrigation acts to protect sensitive ecosystems because it reduces the land area required to dispose of the projected effluent volume. Advantage should be taken of this disposal method.

6) On-lot systems initially act to avoid environmental damage because they eliminate the need for construction of large alternative disposal systems. On-lot systems, however, are known to fail, creating serious environmental impacts. Corrections of these failures and their detrimental impacts can be exceedingly expensive.

In summary, the most environmentally sensitive areas are going to be developed in some manner; either by residential/commercial uses, or by wastewater disposal systems. By constructing artificial wetlands with rapid infiltration basins, or by using forest spray irrigation, the land would be maintained in a less-altered form. This would allow for some continued use of the area by wildlife, particularly the threatened or endangered species. Agricultural spray irrigation, though established and proven, removes forest vegetation, thus removing cover and food for wildlife.

To summarize the environmental impacts of each system alternative for evaluation purposes, a simple rating of the selected alternatives by impact characteristic was prepared. This alternative rating is presented in Table 3-8. It should be noted that this environmental impact analyses does not account for a "weighting" of the environmental impact characteristics, in that all the characteristics are considered of equal importance. From the table, Alternative 2 with its expansion of the T.P. Smith Facility and the SE Forest Spray Irrigation Operations, has an advantage over the other system alternatives. This is primarily due to the use of privately owned forest lands for a spray irrigation disposal site. The use of the privately owned forest lands maintains the existing land use type and allows continued use of the area for wildlife habitats.

3.3 MITIGATIVE MEASURES

The construction and continued operation of any wastewater collection, treatment, and disposal system will create environmental impacts. Mitigative measures can often be implemented to lessen these impacts. The mitigation measures discussed below are not intended as the only available possibilities.

3.3.1 Surface Water

The integrity of surface water resources is of prime concern during the wastewater disposal process, but degradation can also occur during construction of the wastewater collection and treatment facilities. Adequate erosion and sedimentation control measures should be implemented whenever appropriate. This is particularly relevant at the NE Plant site, and for the pipeline from the TPS Plant to the SE disposal site.

It will be crucial to locate the field areas at the proposed disposal sites with careful regard to local topography, slope, and soil conditions. A 400 foot wide buffer zone with dense vegetative cover should be maintained around each area. This undisturbed buffer will act to reduce or eliminate any surface water flow originating at the disposal facilities in the field areas. The use of appropriate wastewater application rates at the agricultural and forest sprayfields will aid in decreasing direct surface water contact along with the prudent timing of applications to avoid, when possible, spraying immediately prior to and during storm events.

TABLE 3-8

ENVIRONMENTAL IMPACT ANALYSES RATING

Impact Characteristics(1)	Selected Alternatives 1	2	7	9
1. Surface Water Quality	1	1	2	2
2. Groundwater Quality	1	1	1	1
3. Protected Species/Habitat	1	1	1	1
4. Floodplains and Wetlands	2	2	2	2
5. Forested Lands	1	3	1	2
6. Parks and Open Space	2	2	2	2
7. Archeological and Historical Resources	2	2	2	2
8. Noise, Odor, and Air Quality	2	2	1	2
9. Land Use	1	3	1	2
10. Socio Economics	3	3	3	2
11. Aesthetics	2	2	2	2
12. Public Health	2	2	2	2
Total	20	24	20	22
Average	1.67	2.00	1.67	1.83
Ranking (2)	2	4	2	3

(1) Rating scale is as follows:
1 - Negative impact
2 - Neutral impact
3 - Positive impact

(2) Ranking goes from most negative impact (-1) to most positive impact (-4). When a tie exists, both alternatives are assigned the same numerical ranking.

3.3.2 Groundwater

The groundwater quality at any of the wastewater effluent disposal sites could be degraded if normal soil-water interaction is not complete. This is of special concern if the applied effluent has high levels of bacterial, viral, and nutrient concentrations. Mitigation of this potential is best made with the use of appropriate application rates on acceptable soil types and effective secondary wastewater treatment.

3.3.3 Ecological Resources

As discussed in section 3.2.1.3, there are at least two key impacts to existing terrestrial and aquatic ecosystems: loss of habitat and human contact. Both of these can be reduced, depending on which alternative is chosen. For example, golf course irrigation is itself a form of mitigation because it eliminates the need for additional disposal areas. With the use of artificial wetlands and rapid infiltration basins, as in alternative 7, not only is the total land requirement reduced but valuable terrestrial and aquatic ecosystems can actually be created. Mitigative measures are most needed in conjunction with the SE agricultural spray irrigation facilities. Removal of the existing forest cover and native vegetation will create wildlife losses, but additional impacts can be reduced by the use of wildlife movement corridors, buffer zones, and the absence of fences. A movement corridor would consist of a strip of undeveloped land connecting areas of high ecological value, such as cypress swamps. Buffer zones would serve as wildlife food and cover areas, and would be maintained around all sides of the agricultural field areas, if possible. Also, by eliminating the use of fences, wildlife would be relatively free to move about their home range or migrate to breeding grounds as necessary. The elimination or diminished use of human contact in any of these areas will also aid in reducing the impact to wildlife.

Mitigation during the construction phase should involve avoiding the unnecessary destruction of vegetation and other wildlife cover by keeping heavy construction equipment within a limited number of designated areas. Construction should also be carried out during periods which will not impair the reproductive behavior or migratory movement of gopher frogs, gopher tortoises, and other native wildlife. The exact number and location of these species at the proposed sites is unknown, and therefore it may be necessary to conduct further field analysis in order to assess impacts on these populations before any irreversible habitat changes are made.

3.3.4 Floodplains and Wetlands

The use of construction equipment in floodplains and wetlands should be avoided, and ideally, a buffer zone should be maintained between construction areas and these sensitive areas. Surface water resources within wetlands can be protected by the appropriate use of erosion and sedimentation control measures. If any alteration of wetlands is to take place during construction, the appropriate wetlands permits must be obtained from the FDER and the appropriate federal agencies.

3.3.5 Agricultural, Historical, and Recreational Resources

Mitigation of impacts on archeological and historical sites would be achieved by stopping or avoiding construction in or near discovered resources. For example, if an archeological site is encountered, construction would be stopped and the Florida SHPO notified. A Level 2 would be warrented. One additional mitigation is the extraction of the resource, if possible, or a modification of the facility design. Historical sites are not known to exist in the study area, and so mitigation is not considered necessary.

Recreational resources are abundant in the areas surrounding Tallahassee. Numerous lakes and ponds serve as fishing, boating, and swimming resources, and attempts should be made to avoid impacts to them. The buffer zones could be established for these areas when considering pipeline corridors and disposal sites so that current recreational activities could continue.

3.3.6 Noise, Odor, and Air Quality

Construction of wastewater conveyance, treatment, and disposal systems will create unavoidable but temporary noise and air quality degradation. Mitigation measures should meet the rules established by the FDER and the Florida Division of Forestry. These measures include the following:

- The use of heavy equipment to be limited to daytime hours during the construction period.
- All earth moving and construction equipment to use factory specification noise suppression equipment (mufflers, engine enclosures, etc.)
- Fugitive dust production from grading and clearing operations and on dirt roads to be controlled using asphalt, oil, water, or dust-suppression chemicals.
- Open burning of debris to be performed at locations at least 50 yards from the nearest occupied building or public highway. Moisture content and composition to be favorable for good burning.

Operation of the disposal systems is not likely to cause significant noise, odor, or air quality impacts. Buffer zones of dense forest vegetation will aid in minimizing noise and odor effects.

3.3.7 Land Use

The impacts to land use change require mitigation in the form of compensation to landowners whose properties would be affected by construction. A change in land use itself does not require mitigation. Landowners will be financially compensated as per the standard for eminent domain in return for land to be used for the NE Plant and any of the NE or SE disposal systems.

3.3.8 Economics and Employment

The impacts to economics and employment are considered positive and, therefore, require no mitigation.

3.3.9 Transportation

The direct and indirect impacts to transportation in the Tallahassee area are considered minimal, but could be reduced even further by controlling the movement of heavy equipment during construction. This control can take the form of designating certain roadways to be used at specified times.

3.3.10 Community Services and Facilities

The expansion of the wastewater facilities in the Tallahassee area to serve projected population growth should be parallel by development of community services and facilities. These include fire and police protection, recreation, health, education, and library facilities and other utilities. These are all part of the normal growth scenario, and mitigation measures are not pertinent.

3.3.11 Summary of Alternatives' Mitigative Measures

As previously stated, the construction and operation of wastewater collection, treatment, and disposal systems will create environmental impacts. These impacts range from traffic congestion to surface water and groundwater quality degradation to the lost of wildlife habitat which is already stressed by normal community expansion.

One of the keys to reducing these impacts is to incorporate golf course spray irrigation as an effluent disposal method. Golf course irrigation is a proven disposal alternative and effectively reduces the land area required by other disposal methods such as agricultural irrigation, forest irrigation, and artificial wetlands.

Another key to reducing potential impacts is to use proper caution when locating the disposal facilities. For example, agricultural and forest spray irrigation facilities should be placed 1) as far as possible from wetlands or other surface water bodies, 2) in upland areas, where infiltration and percolation rates are more favorable, and 3) in areas where large buffer zones possessing dense vegetation can be maintained as sheet-flow reduction areas and as wildlife corridors.

In summary, the best mitigative measures are those that create the most environmental protection while allowing the designed facilities to operate properly.

CHAPTER 4
PREFERRED ALTERNATIVE

CHAPTER 4 PREFERRED ALTERNATIVE

4.1 SELECTION OF THE PREFERRED ALTERNATIVE

EPA has selected Alternative 1 to be the preferred alternative as the proposed action for the draft EIS Supplement. Alternative 1 is referred to as a centralized "treatment south" alternative. This means that all flows would be conveyed to the southwest to receive secondary treatment at either the improved LBR Plant or the expanded TPS Plant. The treated wastewater from the LBR Plant would be disposed of via a spray irrigation operation set up at four (4) golf courses. The treated wastewater from the TPS Plant would be transported to the expanded southeast agricultural spray irrigation fields for final disposal. Sludge generated during the treatment of the wastewater would be disposed of by land application on land around the T.P. Smith Facility and the SW Sprayfield for dewatered sludge disposal and an expanded airport site for liquid sludge disposal.

The selection of the preferred alternative was based on the cost-effectiveness, environmental impact, reliability and implementability findings of Chapter 3. Table 4-1 is a summary of the rankings for each of the four (4) selected system alternatives for the evaluation categories. From this table Alternatives 1 and 2 are ranked equally preferred whereas Alternatives 7 and 9 are slightly less desirable. It was noted in Chapter 3 that the items addressed during the rating process for the reliability, implementability, and environmental impact categories do not incorporate a weighting factor. Weighting of the items would have been difficult to justify because, though certain items could be considered more "important" than others, the determination of a specific weighting value is highly subjective and dependent on the individual's or organization's needs and wants. It was also noted in Chapter 1 that the City has the desire and the financial capability to expand the TPS Plant and the SE Agricultural Spray Irrigation Operations, a plan similar to Alternative 1. The City's experience with agricultural spray irrigation disposal operations has been very successful and the crop production has significantly reduced operation costs. Only two minor water quality violations have occurred. The first violation occurred during the first quarter of 1988. One of the two compliance wells at the SW Sprayfield had a NO_3 concentration of 11.2 mg/l. The maximum limit is 10.0 mg/l. Investigation revealed that a stockpile of dewatered sludge had been placed near the well. The NO_3 concentration in the well fell soon after the sludge pile was moved. During the third quarter of 1989, the NO_3 concentration in this well was only 4.62 mg/l. The second violation occurred during the third and fourth quarters of 1989. At this time there were minor violations in one of the 7 compliance wells at the SE Sprayfield. The NO_3 concentration in Compliance Well No. SE-2 during those sampling periods was 10.7 and 10.1 mg/l respectively. The concentrations in the other six compliance wells were well below 10.0 mg/l. Because of the City's success, Alternative 1 has been selected over the others as the preferred alternative. Environmental impacts and mitigative measures for the preferred Alternative 1 are described in Section 4.2 and 4.3.

TABLE 4-1

SUMMARY OF SELECTED SYSTEM ALTERNATIVE RANKINGS (1)

Category	SYSTEM ALTERNATIVE 1	2	7	9
Cost-effectiveness (2)	3	2	1	4
Reliability	4	3	2	2
Implementability	4	4	4	3
Environmental Impacts	2	4	2	3
Total	13	13	9	12
Ranking	4	4	2	3

(1) Ranking goes from least preferred (=1) to most preferred (=4). When a tie exists for a category, both alternatives are assigned the same numerical ranking.

(2) Cost-effectiveness Overall Ranking

	1	2	7	9
Capital Costs	4	3	2	1
Annual O&M Costs	1	2	3	4
Present Worth Values	3	2	1	4
Annual Household Costs	3	2	1	4
Average	2.75	2.25	1.75	3.25
Overall Ranking	3	2	1	4

4.2 IMPACTS OF THE PREFERRED ALTERNATIVES

4.2.1 Primary Environmental Impacts

The most critical primary impacts of the preferred alternative are potential groundwater and surface water contamination; the removal of trees, in the sprayfield area and the possible disruption of the Gopher frogs' migration path to the north for breeding. Groundwater and surface water contamination can result from the spray irrigation of effluent at the golf courses and the expanded SE sprayfield. Factors that could lead to this include the following:

- Inadequately treated wastewater coming from the TPS Plant or the LBR Plant.
- Inadequate farm operations which include incomplete harvesting to remove all vegetation from the fields and improper cultivation resulting in low crop yields and therefore low nutrient uptake.
- Excessively high effluent application rates.
- Application of effluent immediately prior to or after and during storm events.
- Location of field areas over sinkholes and Karst depressions (potential groundwater contamination).
- Location of field areas on soils with high clay content (potential surface water contamination).
- Inadequate stormwater management facilities (potential surface water contamination).

The removal of trees is the result of establishing field areas for the cultivation of agricultural crops. The disruption of Gopher frog migration routes results from the removal of contiguous habitat areas which are needed to provide undisturbed movement of wildlife around the field areas from the southern end to the northern end of site.

4.2.2 Secondary Environmental Impacts

The secondary environmental impacts of the preferred alternative which generate the most concern are the impacts on land use changes and public health. The public health issue is a concern to residents living adjacent to or downstream of the SE sprayfields. Potential public health threats are related to aerosols containing pathogens traveling off the field area and the potential groundwater contamination of the Floridan Aquifer, a drinking water source. The impact of land use changes at the SE disposal site is related to the change of silvicultural operations to agricultural operations. The concern is not so much for aesthetics or restriction of future land use potential but rather for global warming impacts. Deforestation reduces the capacity of an area of the earth to absorb carbon dioxide from the atmosphere. Carbon dioxide is the major contributor to the greenhouse effect. However, replacement of the forest with irrigated row crops and leaving wooded wetlands and establishing wooded buffer strips will mitigate the loss of trees.

4.3 MITIGATIVE MEASURES

4.3.1 Primary Impacts

Below is a list of mitigative measures that could be used to lessen the potentially detrimental primary environmental impacts of the preferred alternative:

- Continuously monitor the quality of the effluent leaving the wastewater treatment plants. If pollutant concentrations exceed permit limitations, correct problems in the treatment operations and/or design as soon as possible.
- Continuously monitor nearby surface waters and groundwater wells for water quality to detect any excessive increases in contaminants.
- Conduct agricultural operations with the primary goal being the proper disposal of effluent.
- Continuously monitor the soil conditions and the water table level at the field areas (application site) and adjust the effluent application rates accordingly.
- Monitor weather conditions to avoid spraying effluent during inclement conditions.
- During the design and construction phases, locate sinkholes, Karst depressions, and soils with high clay content, and avoid locating field areas at these sites.
- Implement stormwater management at the sites with facilities such as diversions, impoundments, etc.
- Preserve as many trees at the sites as possible. Trees should only be removed from the field areas and designated farm operation areas.
- Locate field areas so that the remaining forested areas of the site are not isolated but rather form a contiguous wildlife corridor throughout the site.

4.3.2 Secondary Impacts

Below is a list of mitigative measures that could be used to lessen the potentially detrimental secondary environmental impacts of the preferred alternative:

- Maintain a buffer zone around the field areas that is a minimum of 400 feet in width along Tram Road, and 100 feet along the other external boundaries. The buffer zone should be an evergreen forested area.

- Restrict spray irrigation operations on windy days to prevent the traveling of aerosols.
- Continuously monitor the quality of the effluent leaving the wastewater treatment plants to insure that the effluent does not contain excessively high levels of pathogenic organisms.
- Preserve as many trees at the site as possible.

CHAPTER 5
EIS
COORDINATION

CHAPTER 5 EIS COORDINATION

5.1 INTRODUCTION

Public participation programs are mandated by federal regulations governing the preparation of Environmental Impact statements. Public participation is an important and valuable part of the EIS process in that it provides for active public (includes interested groups, individuals, and private and governmental agencies) involvement in developing and evaluating wastewater management alternatives and in selecting a preferred alternative. Public participation was an integral part of the preparation of the 1983 EIS. A public participation program was also developed for the preparation of the EIS Supplement. Section 5.3 describes the public participation programs of the 1983 EIS and the EIS Supplement.

5.2 COORDINATION WITH LOCAL, REGIONAL, STATE AND FEDERAL AGENCIES

Many local, regional, state, and federal agencies were contacted for information during the preparation of the 1983 EIS and the EIS Supplement. They supplied information necessary to the decision-making process. Table 5-1 lists agencies that were contracted during the two studies.

5.3 PUBLIC PARTICIPATION PROGRAM

5.3.1 1983 EIS Public Participation

The public participation program included one public scoping meeting and four Review Committee meetings. The Review Committee was formed to serve in an advisory capacity to EPA and their consultants. It was composed of 23 persons representing 10 public agencies and 13 private groups.

On November 29, 1978, a public hearing (scoping meeting) was held in the City to describe the procedures EPA would use in preparing the 1983 EIS. The meeting included presentations on the purpose and background of the EIS, the 201 Study, the scope of the EIS and issues to be addressed, the EIS schedule, and a description of the public participation program. Afterwards, several citizens and officials made comments.

The first Review Committee meeting was held on May 16, 1979 in the City to review the EIS Plan of Study. Gaps in the existing data base for terrestrial and aquatic systems were discussed, and the design of a sampling program was presented. The Committee was asked to confirm if all major issues of the EIS had been identified and incorporated into the work effort.

The format of the first Review Committee meeting and all subsequent ones consisted of a presentation by the EIS consultants followed by the Committee dividing into two round table discussion groups. At the end of the evening, a representative from each table summarized the discussion for the benefit of he other table and observers.

TABLE 5-1

AGENCY CONTACTS

Local and Regional Agencies and Organization

City of Tallahassee, Water and Sewer Department and Sewer Division
Environmental Science Engineering, Inc.
Leon County Environmental Services
Leon County Public Health Unit
Leon County Public Works Division
Munson Area Preservation, Inc.
Post, Buckley, Schuh & Jernigan, Inc.
Springhill Road Concerned Citizen
Tallahassee Historic Preservation Board
Tallahassee Leon County Planning Department
Tallahassee Office of Management and Budget
Tallahassee Water Quality Laboratory
Tall Timbers Research Station
Talquin Electric Cooperative, Inc.
Wm. M. Bishop Engineers, Inc.
W.V. McConnell, Land Management Planner/Forestor

State Government Agencies

Florida Department of Environmental Regulation, Bureau of Wastewater Management and Grants
Florida Department of State, Division of Archives, History, and Record Management
Florida Game & Fresh Water Fish Commission, Office of Environmental Services

Federal Government Agencies

Department of Agriculture, Soil Conservation Service
Department of Commerce, Census Bureau
Department of Defense, Army Corps of Engineers
Department of Interior, Fish and Wildlife Service
Department of Interior, Forest Service
Department of Interior, Geological Survey
Department of Transportation, Federal Aviation Administration
Federal Emergency Management Agency, Region IV, Atlanta, GA

The second Review Committee was held on January 9, 1980, in the City to review the Environmental Inventory task report and the Alternatives Development task report. During the discussion group sessions, Review Committee concerns centered on spray irrigation impacts, wastewater flow projections, the development potential of the northeast portions of the Tallahassee urban area, the desirability of a Northeast wastewater treatment plant, impacts to vegetation and wildlife, and the implementability of widescale use of on-site disposal systems or small community systems.

The third Review Committee meeting was held on January 15, 1981, in the City to review the Alternative Evaluation task report. Each of the four alternatives was discussed in turn. Concern focused mainly on Alternative 1 (T.P. Smith/Southwest and Northeast Plants) and Alternative 4 (No-Federal-Action). the widespread use of on-site systems and their maintenance continued to be a matter of concern. Institutional management aspects of on-site systems were perceived to be a serious problem. Other questions addressed cost analyses and wastewater flow projections.

The fourth Review Committee meeting was held on July 9, 1981 in in the City to present a briefing paper describing the No-Federal-Action Alternative that was selected by the EPA Region IV Regional Administrator. Discussion focused on the need for and responsibilities of a management agency for on-site and small community systems. In addition, committee members requested an expanded discussion in the EIS of causes of system failure, corrective actions, and mitigative measures.

5.3.2 EIS Supplement Scoping Meetings and Public Hearings

The public scoping meeting for the EIS Supplement was held in the City on April 19, 1988. Section 1.2.2 of this document presents the list of concerns that was developed from discussions made during the meeting and from written comments received by EPA. Section 1.2.3 presents the EIS Supplement's issues that evolved from the concerns and from the 1983 EIS issues.

It was decided at the public scoping meeting that no Review Committee would be formed for the project. The public meetings would be held by EPA and would serve as the sole forum for advising the EPA and their consultants of the needs and preferences of the concerned public. Other meetings between EPA, their consultants, and interested parties were held throughout the course of the study as needed. These meetings were primarily for exchange of information and for providing updates of the project's status.

The second public meeting was held November 15, 1988 in the City. The purpose of this meeting was to present the preliminary wastewater management alternatives developed by the EPA and their contractors. This included an effluent disposal alternative utilizing a land exchange option with the U.S. Forest Service. These alternatives were discussed and additional alternatives were identified. These included golf course irrigation disposal, artificial wetlands disposal, conservation and effluent reduction, and higher treatment levels prior to disposal.

Two new and independent issues were raised at the second public meeting. The first is the use of public (USDA FS) land for effluent disposal by spray irrigation. Central to this issue is EPA's and the U.S.

Forest Service's responsibility to assure all human and other environmental impacts are fully considered during the EIS process. The second issue concerns the evaluation of alternative wastewater management systems. The additional alternatives identified at this meeting were to be included in the on-going development of alternative systems and environmental impact assessment for the EIS Supplement.

The third public meeting was held on August 15, 1989 in the City. The purpose of this meeting was to present the results of the wastewater management alternative evaluation process. As a result of this meeting the use of U.S. Forest Service lands, both south of the TPS Plant and west of the Municipal Airport, were dropped from further consideration as alternative spray irrigation sites.

Following completion of the draft EIS Supplement a public hearing will be held.

CHAPTER 6
LIST OF PREPARERS

CHAPTER 6 LIST OF PREPARES

U.S. Environmental Protection Agency, Region IV

Heinz Mueller/Robert C. Cooper/ Robert Howard	Chief, Environmental Policy Section
Cory W. Berish, Ph.D.	Current Project Monitor
Maryann S. Gerber	Prior Project Monitor

Gannett Fleming Environmental Engineers, Inc.

Thomas M. Rachford, P.E., Ph.D.	Program Manager
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Leif Rowles	Environmental Engineer
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Sally Holbert	Environmental Scientist
Cy Whitson	Biologist/Ecologist

ERM - Southeast, Inc.

Glenn Taylor	Program Manager
Frank Gheesling	Project Director, Env. Scientist
Heather Good	Land Use Planner
Jim Orr	Biologist/Ecologist
Hap Reed	Water Resource Specialist/Geologist/ Soil Scientist
Eshelman	Institutional Analyst
Martinson	Institutional Analyst

APPENDIX A
ALTERNATIVE WASTEWATER CONVEYANCE CONFIGURATIONS

APPENDIX A ALTERNATIVE WASTEWATER CONVEYANCE CONFIGURATION

Section A-1 Treatment South

This conveyance component assumes that treatment will take place at the existing LBR Plant and T. P. Smith Facility. The elements of this component are presented below:

1. Construct a pump station west of Ox Bottom Lake to service the area between Meridian Road (FL 155) and Thomasville Road (U.S. 319). Run a force main along Ox Bottom Road and connect it to the existing interceptor south of Lake Killearney.
2. Expand the Northeast Pump Station to service the Lake Killearney development area.
3. Construct a force main along Centerville Road (U.S. 151) from the Northeast pump station to Capital Circle, N.E. (U.S. 319). Continue the force main along Capital Circle, N.E./S.E./S.W. to the T. P. Smith Facility.
4. Construct a pump station southeast of Buck Lake to service Buck Lake development area. Run a force main along Buck Lake Road to Capital Circle, N.E. to join with a proposed force main leading to T. P. Smith Facility.
5. Construct two pump stations, force mains, and interceptors to service the proposed Southeast Lake Jackson area development. Run a force main to the existing interceptor leading to Pump Station No. 22.
6. Construct a gravity relief sewer from the Capital Circle, N.E./ Lonnbladh Road intersection to existing Pump Station No. 22 to alleviate surcharge conditions.
7. Construct a pump station north of the Federal Correctional Institute with a force main leading to a proposed force main along Capital Circle, N.E.
8. Construct a relief force main from the expanded Pump Station No. 22 to a proposed pump station north of the Federal Correctional Institute.
9. Construct a pump station along Perry Highway (U.S. 27) in the Lafayette area to serve the area east of Capital Circle, N.E./ S.E., between the railroad and St. Augustine Road. Construct a force main along Perry Highway to Capital Circle, N.E./S.E. to join with a proposed force main leading to T. P. Smith Facility.
10. Construct a gravity relief sewer parallel to the existing gravity sewer serving the central inner city area near Florida A&M University to alleviate surcharge conditions entering the LBR Plant.

11. Construct a gravity relief sewer along the existing gravity sewer tributary to the Springhill Road pump station to handle projected flows from Springhill Road Service Area.

12. Construct a pump station off Monroe Street (U.S. 27), south of the I-10 Interchange. Construct a force main to the existing interceptor leading to Pump Station No. 36.

13. Construct two pump stations to serve the development along the Megginnis Arm of Lake Jackson. Construct a force main to the existing Pump Station No. 43, directly south of the Monroe Street/I-10 Interchange.

14. Construct two gravity interceptors running north to south: one west of Old Brainbridge Road (FL 157) and the other along Capital Circle, N.W. (FL 263) to serve the proposed development in the western portion of Tallahassee, north of New Quincy Highway (U.S. 90).

15. Construct a pump station adjacent to Capital Circle, N.W. near Gum Road to transport sewage collected by the two interceptors noted in Item No. 14. Construct a force main along Capital Circle, S.W. to the T. P. Smith Facility.

16. Construct two pump stations in series along Capital Circle, S.W. near the Tallahassee Municipal Airport. Construct a force main and interceptor to the existing Pumping Station No. 12 off LBR Plant near Black Swamp.

17. Expand Pump Station No. 12 and construct a new force main to parallel the existing force main along LBR Plant and leading to the Springhill Road Pump Station.

18. Expand Springhill Road Pump Station.

Section A-2 Treatment North and South

This conveyance component assumes that treatment would be located at the existing LBR Plant and the T. P. Smith Facility and that a new NE plant would be constructed in the northeast area of Tallahassee. The elements of this component include elements 1, 2, 5, 6, and 10 through 18 of the Treatment South conveyance component described in the previous section. In addition, this component contains elements to convey flows to the new NE plant which include:

1. Construct the force main from the expanded Northeast Pump Station, south to the proposed NE Plant north of I-10.

2. Construct a pump station along Perry Highway (U.S. 27) in the Lafayette area to serve the area east of Capital Circle, N.E./S.E. between the railroad and St. Augustine Road. Construct a force main along Perry Highway to Capital Circle, N.E./S.E. Continue the force main north on Capital Circle, N.E. to the proposed pump station north of the Federal Correctional Institute.

3. Construct a pump station north of the Federal Correctional Institute to serve the proposed development south of Mahan Drive (U.S. 90) and east of Capital Circle, N.E. Construct a force main along Capital Circle, N.E. to Mahan Drive, east on Mahan Drive, north on Edenfield to Miccosukee Road (FL 146), and north on Miccosukee Road to the proposed NE Plant.

4. Construct a pump station southeast of Buck Lake to serve the Buck Lake development area. Construct a force main north to Mahan Drive to join with the proposed force main leading to the proposed NE Plant.

APPENDIX B
ALTERNATIVE WASTEWATER TREATMENT FACILITIES

APPENDIX B ALTERNATIVE WASTEWATER TREATMENT FACILITIES

Section B-1 Lake Bradford Road Wastewater Treatment Plant

The LBR Plant improvements of component T1 were proposed in the City MSP. The improvements are to increase the facilities influent flow to match its design capacity of 4.5 mgd and to install equipment which will reduce the volume of sludge produced. The items included in the improvement are as follows:

- Modify influent diversion structure to allow higher flows at night.
- Add equipment to make bar screen and grit chamber operation automatic.
- Add flow equalization tank to store excess flow to be pumped through plant at night.
- Upgrade influent pump station for peak flow of 6.75 mgd with two pumps operating and third pump for standby.
- Add sludge thickener.
- Upgrade effluent pump station to match influent pumps.
- Expand sewer division headquarters.

Section B-2 T. P. Smith Wastewater Treatment Facility

The TPS Plant expansion of component T2 was also proposed in the City MSP. This expansion increases the design flow from 20 mgd to 27.5 mgd and includes improvements recommended by the operation and maintenance staff. The items included in the expansion are as follows:

- Add new 27.5 mgd headworks with grit and screenings removal and odor control.
- 7.5 mgd activated sludge expansion with Biological Nutrient Removal.
- Add new anaerobic digester.
- Expand sludge thickening unit with blending tank and odor control.
- Add new building for operations center and shop.

The expansion, along with the upgrading of the LBR Plant, is to accommodate all sewage flows generated, including flows from the Northeast service area. Conveying untreated flows from the Northeast could present special problems as discussed previously in Section 2.3.2. Since expanding an existing plant, in this case the TPS Plant, is much lower in costs and environmental impacts than the construction of a new plant, the additional costs incurred for conveying untreated sewage over a long distance are balanced by the cost savings of not building a new treatment facility. This would not have been the case with a proposed Southeast Treatment Plant which would have included both the additional conveyance costs and the costs of a new facility.

Section B-3 Northeast Wastewater Treatment Facility

The NE Plant construction of component T3 includes facilities to treat 5.2 mgd using conventional activated sludge units with chlorination, anaerobic digestion and mechanical dewatering. The level of treatment to be reached is secondary. The phosphorus removal option includes the replacement of the conventional activated sludge aeration system with a biological phosphorus removal activated sludge system.

APPENDIX C
ALTERNATIVE WASTEWATER DISPOSAL FACILITIES

APPENDIX C ALTERNATIVE WASTEWATER DISPOSAL FACILITIES

Section C-1 SE Agricultural Spray Irrigation

East of the existing SE Sprayfield is an area of St. Joseph's land approximately 1,800 acres in size. The topography and soils on this proposed site, which is the disposal component D1, are significantly different from the existing SE Sprayfield. The proposed site is traversed by two drainage features and another low-lying drainage area is located on the common border between the proposed and existing sprayfields. Due to a high water table and slow drainage characteristics, the soil within the drainageways are not suitable for spray irrigation of wastewater.

The center and the northwest corner of the site is comprised of an area of Kershaw sand, the predominant soil on the existing SE Sprayfield. Kershaw sand is a deep, excessively drained soil with a water table depth of more than 80 inches throughout the year. This soil offers no restrictions to an irrigation plan for 3 inches of applied wastewater per week. Areas of Ortega sand are often found between the areas of Kershaw sand and the low lying drainageway soils. Ortega sands are characterized as moderately well drained soils with an apparent water table from June to January with depths ranging from 40 to 60 inches. The Ortega sand is found in the southeast corner of the existing SE Sprayfield and is evident by ponding after irrigation. The prevalence of drainageways and Ortega sands on the proposed site indicate that an overall irrigation rate of 3 inches per week is not suitable for the site and that an overall application rate in the range of 2 inches per week would be more suitable. Even at 2 inches per week, a rise in the water table of the Ortega sands and an increase of surface water in the drainageways can be expected. However, the decreased application rate should not result in an unacceptable increase in the chemical constituents applied to the site through irrigation.

Assuming that 25 percent of the land is set aside for buffer zones, roads, a holding tank, and farm management facilities, 1,350 acres are available for irrigation. Applying a uniform application rate of 2 inches per week will result in an application of over 10.0 mgd. This effluent flow assumes total utilization of the available land area. The type of application system can affect the utilization of the available land and, therefore, the amount of water treated, and will need to be considered during final design.

The proposed vegetation management activity on the SE Sprayfield expansion is an agricultural crop rotation similar to the existing SE Sprayfield. Vegetation management on the agricultural based system currently operated by the City has been carried out by the Pascuna Florida Corporation for several years. This farm management system has operated satisfactorily and no changes are recommended by evaluations performed for this report. Interviews with the manager of the SE Sprayfield operations indicated that a particular land area would be managed under one of two crop rotation schedules. The first is a three-crop per year rotation of corn, soy beans, and annual rye grass, while the second rotation schedule would include only two crops, soy beans and annual rye grass. Each land management area of the existing sprayfield has the crop rotation schedule switched each year. The facilities and equipment required to utilize the proposed SE Sprayfield expansion are minimized due to its close proximity to the existing SE Sprayfield. In general, the following will be required:

- Effluent holding pond and pump station at the proposed SE Sprayfield expansion site,
- Effluent irrigation equipment,
- Farm equipment and facilities, and
- Groundwater monitoring wells.

Section C-2 NE Agricultural Spray Irrigation

To evaluate land treatment northeast of the City for component D2, land areas generally outside of the development areas were chosen.

The soils in the northeast portion of Leon County have a higher clay content and slower permeability than the deeper, sandier soils found south of Tallahassee. The number of soil types mapped in the potential NE Sprayfield area by USDA SCS is much larger than the number of soil types mapped in the southern portion of the county. As the number of soil types increase, the variability of the site characteristics increases, resulting in a complex mix of soils and the associated properties impacting irrigation. To design a system utilizing the soil types to their maximum potential would result in an extremely complex irrigation network. Therefore, the usual design approach in this situation is to develop a system based on the more restrictive soil types to reduce overall system complexity.

Within the area of the potential NE Sprayfield, several soils exhibit perched water tables during some portion of the year and permeabilities range from 0.06 to 3.0 inches per hour. The most restrictive soil series are the Norfolk, Dothan, Fuguay, Leefield, and Bonifay. These soils, which require special consideration, and the flood plain soils, which are not usable for irrigation, are intermingled with the better suited soils such as Orangeburg, Lucy, and Faceville. Considering the restrictive characteristics of the limiting soils and the intermingled pattern of soil type occurrence, an initial application rate of approximately 0.75 inches per week is recommended.

The NE Sprayfield areas are comprised of approximately 13,450 acres. Of this total, approximately 9,270 are usable acres based on the SCS soils mapping. Assuming that 25 percent of the usable land would be unavailable for irrigation due to pump facilities, holding ponds, roads, and buffer areas, approximately 6,950 acres are available for irrigation. Considering an application rate of 0.75 inches per week, the area could be used for irrigation of approximately 20.0 mgd. It should be noted that the sites have irregularly shaped usable areas, therefore, the actual amount of irrigated acres may be lower depending on the type of irrigation developed on the sites.

The proposed managed vegetation of the NE Sprayfield is an agricultural crop rotation similar to that proposed for the SE Sprayfield Expansion (refer to Section 2.3.3.1). Equipment and facilities required for an agricultural crop is also similar to that described for the proposed SE

Sprayfield. However, it may be necessary to add some farm management items since the existing farm management facilities at the SE Sprayfield are not nearby to allow sharing.

Section C-3 SE and NE Forest Spray Irrigation

An alternative to the management of an agricultural cropped system at the proposed SE and NE Sprayfields would be the establishment of a forested system as presented in components D3 and D4. In general, forested spray irrigation has excellent revenue-producing potential, high water-using potential, and good nitrogen-consumption potential.

Vegetation management is important on a forested land treatment site, but the intensity of management is much lower than required on a cropped system. The forested vegetation type most suited to a spray irrigation system is one that grows well in the Leon County area and is tolerant of high moisture levels. A fast growing southern yellow pine species such as slash pine would be well suited for planting in the sprayfields. Other species to be considered include loblolly pine and pond (swamp) pine. Initial planting practices determine the long-term viability of the trees in a spray irrigation system. To increase the survival and viability of a newly planted stand, seedling bedding should be considered as a part of planting.

Forested spray irrigation systems require less vegetation management than annual crops. Normally, when a system is installed in an area with an existing tree stand, the existing stand can be used for treatment until harvesting. After harvesting is complete and planting is finished, irrigation levels will need to be reduced until crown closure occurs, approximately four to five years, so that the root systems can become established. Once crown closure occurs, normally no further timber stand maintenance is required until harvesting; which may be 20 to 30 years depending on the product to be harvested, either pulp chips or saw timber.

Harvesting: The periodic tree harvest and planting are important to the operational efficiency of the spray irrigation system. To maximize nutrient removal from the site, some type of whole tree harvesting is required. Whole tree harvesting removes the entire standing tree (stem, branches, and leaves) so that 100% of the nitrogen accumulated in the above ground biomass is removed. In addition, some whole tree harvests have utilized coarse root material. For trees not of construction quality, it is recommended that they be skidded to a central point at the site, then chipped and blown into a trailer. Most pulp mills accept whole tree chips and chips can be used as a fuel/energy source.

Harvesting can be carried out by one of two methods; contract harvesting with local harvesting companies, or providing the necessary equipment and training for a city-employed crew. Communication with the USDA FS personnel in Tallahassee concerning harvesting practices revealed several factors to be considered in a harvesting plan. A timber cruise prior to harvest to determine bid volumes costs the Forest Service approximately $10 per 1,000 board feet for sizable blocks of land. A timber cruise on smaller parcels of land could cost 50 percent more.

Local harvesting companies are prepared for whole tree harvesting operations, however, harvesting constraints will reduce the bid price from these companies. Harvesting constraints will be necessary due to the land treatment goals of the system. Typical constraints on a harvesting contract would be limiting inclement weather access to reduce site damage, and a contractual agreement detailing responsibility for damage to sprinklers and associated piping. Experienced Forest Service personnel indicated that moderate restrictions on a harvesting activity can reduce the stumpage price by more than 50 percent. Recent bid prices were $150 per 1,000 board feet for saw timer and $30 per 100 cubic feet for pulpwood. A 50 percent or greater reduction in these prices will significantly reduce the return on the timber product.

The other harvesting alternative would be to equip a city crew so that harvesting could be managed under conditions which might minimize the possibility of site disturbance and damage to the irrigation system. A capital investment for harvesting equipment and an ongoing Operation and Maintenance (O&M) cost will be necessary to provide harvesting capabilities for a city-staffed crew. A harvesting operation can involve several pieces of equipment such as; a feller-buncher, skidder, chipper, chip hauling vans, and a tractor rig for moving the chip vans from the site to the wood processing plant.

Irrigation System: The general design parameters recommended for this alternative include the following:

- Buried, solid-set sprinklers with sprinkler and pipe spacing to be 60 feet and 80 feet, respectively. This represents approximately 9.138 sprinklers per acre.
- Nozzle pressure to be between 55 and 70 psi.
- Nozzle openings to be between 1/4 and 3/8 inch, depending on spacing, pressure, radius of throw, and gallons per minute application rate. Note, no stream straightener mechanism should be used.
- Last filtering/screening treatment unit should ensure that the largest particle in the wastewater is less than 1/3 of the diameter of the sprinkler nozzle.
- Storage shall be provided for a maximum of 7 days of flow.

The application rates for this system depend on the age of the tree stands. Generally speaking, the system is hydraulically limited, not nitrogen limited. For an existing, mature forest, the application rate can be as high as 3 inches per week (the same as that for a crop system) without damaging the trees. For new forest areas, the application rate should be about 50 percent of the peak rate, or 1½ inches per week. Currently, the FDER is concerned about the rate of 3 inches per week being too high and subsequently contaminating groundwaters. Therefore, for this alternative, the land area requirements were derived based on an application rate of 2 inches per week for mature plots of trees and 1½ inches per week for newly planted plots of trees. It is recommended though that all irrigation equipment be specified and designed to handle the higher rate of 3 inches per week to allow for possible irrigation at that rate when it is considered no potential threat to the groundwater quality.

It should be noted that the lower rate of 1½ inches per week is generally recommended until crown closure occurs which can take four to five years. Assuming that the rate to be used on the mature stands is only 2 inches per week and that a growth of herbaceous vegetation will be allowed, it is considered safe to use the 1½ inches per week for only two years on a "new" plot.

Other items to be considered in the design of this irrigation system include:

- o Buried main lines and lateral should have drain valves to drain lines after applications are complete.
- o Screening of the stored water is required to avoid nozzle clogging from debris that may fall into the storage pond (screening to catch particles that are greater than 1/3 the diameter of the nozzle).

Operations: A buried, solid-set sprinkler distribution system was recommended because it will not interfere with forest management activities including thinning, harvesting, and replanting. The sprinkler risers should be high enough to raise the sprinklers above most of the understory vegetation, but not greater that 5 feet above ground level. It is also recommended that low trajectory sprinklers be used so that water is not thrown into the tree canopies. The site preparation tasks consists of clearing a 10 foot wide path for each buried lateral. Construction must be carefully done to avoid excessive damage to trees and soils. After construction, the disturbed area must be mulched or seeded. During operation, a 5 foot-radius area around each sprinkler should be kept clear to provide for better distribution and more convenient observation of sprinkler operation.

Forest crop management practices consist of maintaining existing forest stands, harvesting, and reforestation. The specific tasks depend on the tree species, age and structure of stands, method of reproduction, the terrain, and the type of equipment and techniques used by local harvesters. The application rate of wastewater is generally not limited by a forest's nitrogen uptake and storage abilities. Therefore, the management practices should be designed to optimize the nitrogen uptake. Generally, the nitrogen uptake is slow during the initial growth stage and should be supplemented by establishing a growth of understory vegetation and restricting the wastewater loading rate. Following the initial growth stage, the nutrient uptake increases and remains constant until maturity. At maturity, the rate decreases, and therefore, the trees should be harvested. Generally, maturity of southern pines is reached at 20 to 25 years, but harvesting can be done on a more frequent cycle.

If the selected irrigation area consists of an existing, uneven-aged forest, the desired forest composition, structure, and vigor should be achieved through thinning and selective harvesting. This practice optimizes the nutrient storage and promotes reproduction growth of an understory. Recommended tree density, in light of the irrigation process is approximately 450 to 500 stems per acre. Thinning is usually done initially to enable construction of the distribution system, but then should only be done once every 10 years or so to minimize soil and site damage. Therefore, for this operation it is recommended that thinning be done for uneven-aged forests at the time of harvesting the mature, marketable trees (every 10 years for a given plot). If the selected irrigation area consists of an even-aged forest, the practice is to clear-cut the forest at harvest age and regenerate a stand by planting seedlings. Of course, the total irrigation area may consist of both uneven- and even-aged forests. These forests should be divided into plots and managed accordingly.

During reforestation, maintenance could include controlling but not eliminating the herbaceous vegetation. As stated previously, this vegetation acts as a supplemental nitrogen sink for young forests, but if left unattended it could shade out the desirable forest species. If the herbaceous vegetation is eliminated, then the wastewater application rate must be reduced during the establishment period. Generally, the establishment period is considered the period required for crown closure to occur which is approximately four to five years. After crown closure has occurred for a given plot, it is recommended that the herbaceous vegetation of the understory be harvested and removed from the site. This is necessary to prevent the decaying vegetation from adding to the nitrogen supply of the system.

Land Area Requirements

Land area requirements consist of acreage for the field area, buffer zones, wastewater storage area, and area for preapplication treatment facilities (includes screening and filtering if not done at the treatment plant), buildings, roads, and future expansion.

The field area of the irrigation system is that portion of the land application site to which wastewater is actually applied, including necessary dikes, ditches, and berms.

It is recommended that the entire land application site include a buffer zone around its perimeter. This zone is primarily for control of public access and to provide aesthetics and is not necessarily a public health measure. The buffer area is recommended to be a maximum of 200 feet wide. In general, it should be managed as a multi-storied forest canopy by maintaining mature, tall trees on the inside edge of the buffer next to the irrigated field area. Trees of moderate height and with full, dense canopies should then be used beneath the tall, inside canopy and out to the outside edge of the buffer. Evergreen species are preferred for year-round operations.

The storage of wastewater during wet-weather conditions is essential to avoid surface runoff due to rainfall. It is recommended that the storage pond be designed for 7 days of storage.

Section C-4 Power Plant Cooling

Under alternative component D5, an average of 3.0 million gallons per day (mgd) of effluent from the TPS Plant would be used for power plant cooling at the A. B. Hopkins Generating Station. To implement this alternative component, the level of treatment at the TPS Plant would have to be upgraded beyond the current secondary treatment levels to include filtration and high-level disinfection. Phosphorus removal would also be required to meet the power plant's discharge requirement of 1.65 mg/l as total P.

The treated effluent would be conveyed via a new force main that would have to be constructed from the treatment plant due west to a power line right-of-way, then northwest to the power plant, following various power line rights-of-way. There would have to be a storage facility constructed at the power plant to store approximately three million gallons (approximately one days' required flow).

It is estimated that the cooling tower blowdown would be approximately 1.0 mgd. Therefore, a discharge permit would have to be obtained if the blowdown were to continue to be discharged to a tributary of Lake Talquin. Alternatively, other methods of disposal could be investigated.

Section C-5 Golf Course Irrigation

Under alternative component D6, 3.0 mgd of treated wastewater from either the TPS Plant or the LBR Plant would be used to irrigate four (4) golf courses in the Tallahassee area. The selected golf courses would be:

- Florida State University Golf Course,
- Jake Gaither Golf Course,
- Capital City Country Club, and
- Hilaman Municipal Golf Course.

It is estimated that each golf course would use an average of 0.75 mgd of effluent and storage of several days' flow could be accommodated in existing ponds at the golf courses. The existing irrigation systems at the courses would be used to distribute the reclaimed water.

To implement this alternative component, the level of treatment at the discharging treatment facility would have to be upgraded beyond the current secondary treatment levels to include filtration and high-level disinfection. It should be noted that it may be more difficult to provide the required additional treatment at the LBR Plant than the TPS Plant due to the age of the facility and space limitations.

A force main would have to be constructed to convey the treated effluent to the various golf courses. If using LBR Plant effluent, there would be a slight reduction in pipeline lengths and it would not be necessary to pump effluent to the TPS Plant and the SE Sprayfield on a regular basis. The existing pipeline between the LBR Plant and TPS Plant would provide an alternative effluent disposal route in the event that treatment levels would fall below the requirements for use on the golf courses or rainfall was so great that additional irrigation could not be handled at the golf courses. In any case, the force main could be tapped at other locations in the future, such as cemeteries, parks, and school grounds. In addition, the nutrient value of the treated effluent may allow a reduction in the application of commercial fertilizers at the irrigated sites.

Section C-6 Golf Course and State Gardens Irrigation

Under alternative components D7 and D8, 0.5 mgd of treated wastewater from the proposed NE Plant would be used to irrigate the Killearn Golf Course and Country Club in northeast Leon County. A secondary level of treatment with filtration and high-level disinfection would have to be provided to meet DER requirements for this type of reuse.

Existing ponds at the golf course could be used to provide approximately one days' worth of storage (0.5 mgd). The existing golf course irrigation system would be used to distribute the treated effluent.

Component D8 provides for disposal of an additional 0.5 mgd of treated wastewater from the NE Plant to irrigate the Alfred B. Maclay State Gardens in northcentral Leon County. Reclaimed water is known to have adverse effects on some vegetation (azaleas and some tree species); therefore, an evaluation of the plant species at the State Gardens would have to be made to determine acceptable irrigation areas. A storage facility would have to be constructed at the State Gardens, but the existing irrigation systems would be used to distribute the treated effluent.

Section C-7 Power Line Right-of-Way

Under alternative component D9, an average of 2.0 mgd of treated effluent from the TPS Plant would be used to irrigate power line right-of-way areas south of the treatment facility. To implement this alternative, the level of treatment at the TPS Plant would have to be upgraded beyond the current secondary treatment levels to include filtration and high-level disinfection.

It is assumed that an average application rate of 2.0 inches per week could be maintained and that the power line right-of-way areas have an average width of 100 feet. Therefore, approximately 26.67 miles of right-of-way would be required to provide enough area to dispose of 2.0 mgd of treated effluent. Solid set (buried) sprinklers would be used and no storage would be required. It is expected that the maintenance costs associated with the right-of-way areas would increase due to the need to mow the irrigated areas more frequently.

Section C-8 Existing Sludge Disposal Fields

Under alternative component D10, an average of 3.9 mgd treated effluent from the TPS Plant would be sprayed on the existing sludge disposal fields around the Tallahassee airport. No additional treatment would have to be provided beyond the current secondary treatment level and basic disinfection.

A force main would convey the treated effluent due west from the TPS Plant to the southwest area of the airport land for distribution to the sludge fields. The application rate is assumed to be 2.0 inches per week. Center pivot sprinklers would be used and storage facilities would not be required.

The effluent quality from the TPS Plant would meet FDER requirements for this type of land application. Minimal site preparation would be required; however, an evaluation would have to be made of the possible adverse effects that spray irrigation may have on airport activities and adequate buffer zones would have to be established. Also, if the irrigation was to be used to produce crops, then coordination of the sludge disposal activities and imposition of agricultural restrictions would have to be dealt with. While this method of effluent disposal is practiced in other areas, regulatory acceptance of the Tallahassee area is not known.

Groundwater monitoring may be required to track the potential leachate contamination due to the combination of sludge and effluent disposal on the same lands.

Section C-9 Rapid Infiltration Basins

Under alternative components D11 and D12, treated effluent would be conveyed via force main to rapid infiltration basins (RIBs) in an area south of Tram Road and east of the existing SE Sprayfield or to the NE disposal sites. It is expected that the secondary treatment level and basic disinfection would be adequate from a public health viewpoint. However, additional nitrogen removal would most likely be required to prevent groundwater contamination. These components could be combined with components D16 and D17, the artificial wetlands. Effluent from the wetlands disposal components, which has a higher quality than effluent directly discharged from secondary treatment facilities, could be directed to RIB's for final disposal.

It is assumed that an average application rate of 10.0 inches per week could be maintained and no storage would be required. Also, the RIBs would be constructed as small, one-acre cells which will roughly double the total land requirement when the buffer areas and access roadways are incorporated. Extensive groundwater monitoring would be required along with careful consideration of sinkhole activity in the area to prevent "short circuiting" of the infiltration system.

Section C-10 Landscape Irrigation and Disposal in Percolation Ponds (Redistribution)

Under alternative component D13, 1.5 mgd of treated wastewater from the TPS Plant would be used for landscape irrigation of residential or other land in the eastern area of the City and could also be discharged into small percolation ponds for disposal. A 15-mile force main from the TPS Plant would parallel Capital Circle to Centerville Road, then parallel Centerville Road in a northeast direction to Interstate 10. To implement this alternative, effluent at the TPS Plant would have to be upgraded beyond the current secondary level to include filtration and high level disinfection.

Specific irrigation and percolation areas have not been identified, and it has been assumed that approximately 100,000 gpd of wastewater would be used per mile of pipeline. The force main would be tapped at various locations along its route. A 1.5-mgd covered storage tank would be provided.

The upgraded effluent would meet FDER requirements for unrestricted access urban irrigation and would not present any significant health risks. The use of treated effluent for irrigation would replace existing and future withdrawal of groundwater, thus conserving groundwater resources.

Section C-11 Surface Waters

The disposal of treated wastewater by discharge to surface waters is the most common method currently used in the United States. It involves piping treated wastewater (effluent) from the wastewater treatment facility to a suitable body of water. This may include a creek, canal, stream, river, pond or lake. It may also include various locations in the ocean such as bays, inlets, channels or offshore waters. Regardless of the surface water feature chosen, the receiving water must be of a quality and volume to render the effluent/receiving water mixture acceptable to established water quality standards and criteria. In addition, the effluent must meet the standards and criteria that describe the use classification for the receiving water.

The FDER and the EPA actively regulate the discharge of effluent to surface waters in the Tallahassee-Leon County area. Although EPA administers the National Pollution Discharge Elimination System (NPDES) permitting in Florida, FDER must certify that the NPDES permit will not violate state water quality standards. Chapter 403 of the Florida Statutes sets forth surface water classifications and water quality standards by which surface water discharges are evaluated. In the Tallahassee-Leon County area many of the surface water bodies are hydraulically connected to the groundwater (e.g., sinkholes), which is further regulated by FDER through Chapter 376. Disposal of effluent into the Florida jurisdictional waters of the Gulf of Mexico would add the local regulations of a second county and Chapter 161 of the Florida Statutes, the Beach and Shore Preservation Act, also administered by the Department of Natural Resources.

Until the completion of the SE sprayfield, the City disposed of its effluent in the Munson Slough-Lake Munson surface water system. Currently, there are no major permitted effluent discharges to surface waters in the Tallahassee-Leon County area. Effluent disposal in the Florida jurisdictional waters of the Gulf of Mexico has never previously been considered as an alternative for Tallahassee-Leon County.

The alternative component D14 provides options for effluent disposal by discharge to surface waters as listed below.

- Construct a gravity/pressure pipeline from the treatment plant(s) to one or more of the selected surface waters.
- Dispose of effluent in one of several local stream/lake systems.
- Dispose of effluent in one of two major rivers; the St Marks River and Ochlockonne River.
- Dispose of effluent in the Florida jurisdictional waters of the Gulf of Mexico.

The location of the outfall lines would follow existing rights-of-way such as roads or power lines whenever possible. The point of discharge should be selected to maximize effluent dispersal and dilution.

Section C-12 Deep Well Injection

Disposal of treated wastewater (effluent) by deep well injection, as presented in component D15, involves the drilling of a well(s) into a suitable geologic formation and pumping the effluent into the groundwater. Depending upon the effluent flow rate and the permeability/transmissivity of the receiving geologic formation (aquifer), several wells may be required at different locations. The receiving aquifer must also be of a use classification that is compatible with the effluent quality.

There are three levels of groundwater regulation in Florida. The FDER, through Chapters 403 and 376 of the Florida Statutes, has the primary and broadest control over groundwater quality. The Northwest Water Management District has authority over consumptive use of groundwater as provided in Chapter 373 of the Florida Statutes. The Water Management District also plays a role in the FDER Technical Advisory Committee for deep well injection permitting. There is a provision of Chapter 403 that also allows local governments to establish regulations equal to or more stringent than FDER's regulations. At this time, there are no FDER approved deep well injection programs in the Tallahassee-Leon County area.

The 1978 EIS (EPA 1978) reported that no acceptable geologic formations were located at practical depths in the Tallahassee-Leon County area. Concern still exists as to whether the confining layers of the Floridan Aquifer are continuous enough to protect this potable water aquifer. Other potentially suitable geologic formations located below the Floridan Aquifer would be at depths ranging from 3,500 feet to 5,000 feet. To date, there have been no attempts to investigate the suitability of the geologic formations at this depth.

The alternative component elements for effluent disposal by deep well injection is presented below:

- Install a test well to a depth necessary to identify a geologic formation suitable for the injection of effluent volumes and quality proposed by Tallahassee-Leon County.
- Construct a gravity/pressure pipeline from the treatment plant(s) to one or more well locations.
- Construct the necessary number of wells to the specifications determined by the test well. This may include pumps, casing screens, and borehole pumps.

The location of deep well injection facilities is mostly determined by the volumes of effluent and the permeability/transmissivity since the Tallahassee area is underlain by relatively uniform, horizontal geologic formations. These conditions withstanding, the wells should be located near the treatment facilities to reduce piping.

Section C-13 Artificial Wetlands

This alternative component considers the wastewater treatment capabilities of artificial (man-made) wetlands. Wetlands can remove significant amounts of BOD, suspended solids, nutrients, metals and bacteria from wastewater. Their treatment efficiency is dependent upon several variables, including:

- Wetland type
- Vegetation
- Filtration media (soil)
- Influent characteristics
- Wastewater flow
- Temperature
- Detention time

Artificial wetlands have the same pollutant removal capabilities as natural wetlands, without many of the potentially negative impacts. Negative aspects of using natural wetlands can include disruption to wildlife, increased mosquito breeding, odor generation and nutrient and sediment flushing. These aspects can be controlled more easily in a man-made system.

There are two major types of artificial wetlands: free water surface and subsurface flow. The key difference is that free water surface systems are flooded and utilize submerged or floating vegetation while subsurface flow systems are filled with a gravelly media and the water is kept below the surface of the media to support emergent vegetation. The artificial wetland system considered for this component is subsurface flow.

Subsurface flow systems are basically horizontal trickling filters with an extensive root system in the media. These systems were developed in West Germany and have seen limited usage in the U.S. Therefore, a pilot program should be developed prior to full-scale construction to more accurately predict the actual pollutant removal efficiency of the full-scale system. The criteria used to develop this component were taken from the EPA Design Manual - Constructed Wetlands and Aquatic Plant Systems for Municipal Wastewater Treatment.

The sizing and design of a wetland treatment system is dependent upon the type of treatment desired. A wetland can be designed to remove primarily BOD, suspended solids and metals, or it can be changed to provide more nutrient removal. Nutrient removal is achieved primarily through vegetative uptake and sequestering in plant tissues. Nutrient removal efficiency is a function of the contact time between the wastewater and the plant root systems and the period of time between plant harvests. The EPA Design Manual suggests that a detention time of 5-7 days is needed to produce an effluent with TKN less than 10 mg/l. BOD and suspended solids removal can be achieved with shorter detention times. This may change for any final design, based upon the actual method of discharge and the regulatory discharge limits.

Influent is distributed to the system through a slotted pipe which is placed on top of a coarse stone discharge area. From there, the wastewater flows through a 30-inch deep gravelly sand mixture (maximum 10% of particles with 8 mm diameter) that is planted with bulrushes. The media is lined with an artificial or compacted clay liner with a permeability of 1×10^{-6} meters/second. The entire system has a slope of 1.5 percent from the influent end to the discharge point. Discharge is through another coarse stone filter and slotted collection pipe.

The wetland facility can be divided into multiple cells to provide better O&M characteristics. Higher temperatures and biological activity in the summer should allow for the use of only selected cells, permitting harvesting and maintenance of other cells. The areas set aside for wetland facilities must include area to allow for harvesting and maintenance functions between the individual wetlands. As stated above this component is designed to be planted with bulrushes, a grass like herb that grows in clumps. An alternative to the use of bulrushes is the design of a more complex wetland that includes the use of more diverse vegetation. This vegetation can include cattails, reeds, and woody, long-lived plants including water-tolerant trees and shrubs. The more diverse the vegetation, the less dependent the wetland's removal efficiency is on one particular plant species.

Discharge from the wetlands can be through one of four methods. The first method involves elimination of the effluent collection pipe discussed previously and allowing sheet flow into a natural wetland or stream. The second method involves collecting the effluent in a pipe and discharging it as a point source into a stream. The third alternative is pipe collection and discharge into rapid infiltration basins. This provides groundwater recharge and removes the surface discharge. The fourth alternative is pipe collection and spray irrigation. Under this alternative the wetlands provide additional treatment capacity and the stream discharge is eliminated. The drawback to this alternative is the large total land requirement.

Treatment efficiency of artificial wetlands varies. However, the EPA Guide lists the BOD and suspended solids percent reductions for two subsurface flow wetlands systems in Maryland and Australia. The average BOD removal efficiency of these two systems is 78 percent. Suspended solids removal averages 82 percent. Nitrogen removal is said to range from 25 to 85 percent for constructed wetlands. Given the 7-day detention time used here, an estimate of 50 percent nitrogen removal could be expected. Phosphorus removal is typically less than nitrogen removal. The National Space Technology Lab studies conducted in the late 1970's have reported phosphorus removal in the range of 28 to 57 percent.

APPENDIX D
ALTERNATIVE SLUDGE TREATMENT AND DISPOSAL FACILITIES

APPENDIX D ALTERNATIVE SLUDGE TREATMENT AND DISPOSAL FACILITIES

Section D-1 Land Spreading

Solids generated during wastewater treatment are being stabilized by aerobic and anaerobic digestion, thickened to reduce the volume of sludge, and disposed by land application. The City currently disposes of the majority of its sludge by landspreading it in liquid form on land the City owns around the municipal airport. The remainder of the sludge is dewatered on belt filter presses and applied to land around the T. P. Smith Facility or on the sprayfield adjacent to the T. P. Smith Facility. Total land available for sludge application is currently 806 acres.

Based on operating experience at the T. P. Smith Facility and LBR Plant, the City generates approximately 0.36 dry tons of sludge per mgd of wastewater treated. The stabilized sludge total nitrogen content has averaged approximately 6.1 percent. Future sludge production is estimated to be 4,070 dry tons per year with a resulting total land requirement of 1,210 acres for the planning year 2010. The City will have to obtain additional acreage for landspreading (currently has a total of 806 acres) to handle the projected sludge production levels. For the purposes of developing this alternative component, it was assumed that the City would continue to use the land around the T. P. Smith Facility and SW Sprayfield for dewatered sludge disposal and an expanded airport site for liquid sludge disposal. Sludge generated at any proposed wastewater treatment plant (e.g., NE Plant) will be disposed in liquid form on land adjacent to the effluent disposal site.

Section D-2 Pelletization

An alternative sludge handling and disposal option considered for the County area is the use of the heat drying/pelletization process. The process of heat drying dewatered sludge involves exposing the sludge to hot gases, thereby producing a dried sludge containing 10 percent or less moisture content. The final product resulting from heat drying is a small sludge pellet or bead that has been sold in portions of the United States as a soil conditioner and supplemental soil nutrient source.

The fertilizer value of the sludge pellet would be approximately the same as the dewatered sludge, but conveyance, transportation and application of the pellets would be easier. The overall mass and volume reduction achieved through pelletizing would reduce the number of truck trips from the treatment plant to the land application sites. The area required for on- or off-site final product storage would also be less than the dewatered sludge. However, the land area required for final disposal of the pellets is the same as that required for dewatered or liquid sludge.

The heat drying sludge process considered for the County area is the direct rotary dryer unit system. Mechanically dewatered sludge at 20 percent total solids content is added to a mixer and blended with previously dried sludge. The blended sludge is then fed to a rotary dryer. The number of dryers needed depends on the volume of sludge produced. Each dryer would be a 3-in-1 drum design, 12.5 feet in diameter and 42 feet long. Within the dryer the sludge moves forward through a center cylinder, then back through an intermediate cylinder and forward through another cylinder toward a fan on the discharge end. Heated air would be provided by a furnace which would burn natural gas, fuel oil, or other fuels such as digester gas, wood, or coal. Typical dryer inlet temperatures would be 800° F and sludge outlet temperatures would be about 180° F. Although the sludge temperature is too low to destroy organic matter, the process does reduce the level of pathogens present in the sludge, thus allowing the pellets to be sold without restriction as to pathogens.

After passing through the rotary dryer, the sludge is introduced to a product sizing cyclone separator where entrained solids are removed from the offgas. The spent gases then go through an air pollution control system for deodorization and particulate removal. Facilities required for the pelletization process include the feed sludge/recycled dried sludge mixing system, furnaces, rotary dryers, product sizing devices, product storage silo, odor and fugitive dust controls, and a separate building to house the process.

APPENDIX E
GLOSSARY

APPENDIX E GLOSSARY

Aerosols - A suspension of colloidal solid or liquid particles in air and gas, having small diameters ranging from 0.01 to 50 microns.

Area Systems - Wastewater Management facilities with design average daily flows less than 500,000 gpd. FDER refers to these facilities as Type II (flows between 100,000 and 500,000 gpd) and Type III (flows between 2,000 and 100,000 gpd)

Bedrock - The more or less solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface. It may be soft, medium or hard and have a smooth or irregular surface.

Biochemical Oxygen Demand - Measure of the concentration of organic impurities in wastewater. The amount of oxygen required by bacteria while stabilizing organic matter under aerobic conditions, expressed in mg/l, is determined entirely by the availability of material in the wastewater to be used as biological food, and by the amount of oxygen utilized by the microorganisms during oxidation. Usually referred to as BOD.

BOD - See Biochemical Oxygen Demand.

Bonifay Soil Series - USDA SCS soil series with soils that are fine sand, nearly level to gently sloping, and well drained.

Borings - Cylindrical samples of a soil profile used to determine infiltration capacity.

Bulrushes - Members of the genus Juncus and are perennial, grass-like herbs that grow in clumps. They are capable of growing well in water that is 2 inches to 10 feet deep. Desirable temperatures are 61 to 81 °F and desirable pH range is 4 to 9.

Canopy Roads - Scenic, two lane roads, usually found in rural areas, where the mature tree stands form a rooflike cover over the road with their branches.

Channel - A natural or artificial watercourse with a definite bed and banks which confine and conduct continuously or intermittently flowing water. See "Watercourse".

Chemical Oxygen Demand - A measure of the oxygen equivalent of that portion of organic matter that is susceptible to oxidation by a strong chemical oxidizing agent. Usually referred to as COD.

COD - See Chemical Oxygen Demand.

Cody Scarp Sandhills - A physiographic region characterized by dry, mostly low sandhills over limestone, allowing moderately rapid recharge of surface water to the Floridan Aquifer. It has small, circular lakes, but only two intermittent channels. Native vegetation was longleaf pine - turkey oak forests, but is now pine plantation.

Confining Layer - A geological layer including low permeable soil, bedrock, and water table, that prohibits the flow of liquid.

Dothan Soil Series - USDA SCS soil series with soils that are loamy fine sand, nearly level to sloping, and well drained.

Emergent Plants - Aquatic plants that are rooted in the sediment but whose leaves are at or above the water surface. These wetland plants often have high habitat value for wildlife and waterfowl, and can aid in pollutant uptake.

Erosion - The removal of soil particles or rock fragments of the land surface by the action of running water, wind ice, or other geological agents.

Eutrophication - The process of over-enrichment of water bodies by nutrients often typified by the presence of algal blooms.

Evapotranspiration - The combined loss of water from a given area and during a specific period of time, by evaporation from the soil surface and by transpiration from plants.

Faceville Soil Series - USDA SCS soil series with soils that are sandy loam, strongly sloping on upland, and well drained.

Field Area - The "wetted area" where treatment/disposal occurs in a land application system.

Floodplain - The nearby level land area situated on either side of a channel which would be inundated temporarily by overflow waters caused by stormwater runoff.

Fuguay Soil Series - USDA SCS soil series with soils that are fine sand, nearly level to sloping, and well drained.

Groundwater Recharge - Replenishment of existing natural underground water supplies.

Heavy Metals - Trace quantities in wastewater of many metals, including nickel, manganese, lead, chromium, cadmium, zinc, copper, iron, and mercury. Some of these metals are necessary for the growth of biological life. The presence of any of these metals in excessive quantities will interfere with many beneficial uses of the water because of their toxicity.

Horizon, Soil - A layer of soil or soil material approximately parallel to the land surface and differing from adjacent genetically related layers in physical, chemical, and biological properties or characteristics (e.g., color, structure, and texture).

Hydrogen Sulfide - A chemical compound formed from the decomposition of organic matter containing sulfur or from the reduction of mineral sulfites and sulfates. It is a colorless, inflammable, highly toxic gas having the characteristic odor of rotten eggs.

Impervious Area - A surface which prevents the infiltration and percolation of water into the ground.

Infiltration - The flow of a liquid into a substance through pores or other openings, connoting flow into a soil in contradistinction to the word, percolation, which connotes flow through a porous substance. The infiltration capacity is expressed in terms of inches per hour.

Karst - The geologic condition in which limestone is dissolved by groundwater, forming underground voids, and resulting in surface depressions, or sinkholes.

Kershaw Soil Series - USDA SCS soil series with soils that are sand, nearly level to sloping, and excessively drained.

Leaching - The removal of soluable material from soil by percolating water.

Leefield Soil Series - USDA SCS soil series that loamy sand, nearly level, and poorly drained.

Lucy Soil Series - USDA SCS soil series with soils that are fine sand, nearly level to sloping, and well drained.

Marsh - Wetlands that are characterized by soft-stemmed herbaceous emergent plants, such as cattails and pickerel weed. Shallow marshes are those with up to six inches of water; deep marshes have as much as two to three feet of water. Seasonal fluctuations in the water level may occur. The Everglades is an example of a vast expanse of marshland.

Mottling, soil - Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage.

Mounding - (1) Filling the area for the on-lot absorptions field with suitable soil material (usually sand) to the level above the water table necessary to meet local and state requirements. (2) The process in which an artificial water table is created on top of a confining layer in the ground. Over a period of time if the water can not drain properly, the top of the water table will approach the ground surface and create ponding problems.

Mound System - See Mounding, first definition.

Nitrogen - Chemical element usually available as ammonium, nitrate, and nitrate ions, and certain simple amines for the growth of plants and protista. A small fraction of organic or total nitrogen in the soil is available at any time. Excessive amounts of nitrogen in water (usually measured as nitrate nitrogen) can be detrimental to the health of infants.

Nonpoint Source Pollution - Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

Norfolk Soil Services - USDA SCS soil series with soils that are loamy fine sand, gently sloping to moderate sloping, and well drained.

Nutrients - Substances necessary for growth of protista and plants in water. Most important nutrients include nitrates and phosphates. Trace quantities of other elements such as iron are also needed for biological growth. Excessive amounts of nutrients results in the uncontrolled growth of plant matter such as noxious algal blooms in surface waters.

Orangeburg Soil Series - USDA SCS soil series with soils that are fine sandy loam, nearly level to strongly sloping, and well drained.

Organic Matter - Plant and animal residue in the soil in various stages of decomposition.

Ortega Soil Series - USDA SCS soil series with soils that are sand, nearly level to gently sloping, and moderately well drained.

Pathogens - Infectious organisms. Most numerous pathogens in wastewater are bacterial pathogenic organisms. Those excreted by man can cause diseases of the gastrointestival tract, such as typhoid and paratyphoid fever, dysentery, diarrhea, and cholera. Usually the coliform group of organisms is used as an indication of the presence in wastewater of feces and hence pathogenic organisms.

Perched Water Table - A type of unconfined aquifer in which the water body is separated from the main groundwater by a relatively impermeable stratum.

Percolation - The downward movement of water through the soil.

Permeability - The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil.

Phosphorus - Inorganic element that is readily available in the form of orthophosphate for the growth of plants and protista.

Ponding - Standing water on soils in closed depressions. Unless soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Renovate - In the context of wastewaters this refers to the biological treatment of the wastewater in a constructed facility or in a natural setting (such as wetlands or soils) to restore them to a quality standard that allows reuse of the water.

Runoff - The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soils is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow.

Secondary Treatment Level - Wastewater treatment to a level that will achieve the effluent limitations specified in Chapter 17-6, Part 1, Section 17-6.060 (1)(a) of FDER Rules and Regulations.

Sedimentation - The process by which solid material, both mineral and organic, is accumlated; transported, or deposited by moving wind, water, or gravity. Once this matter is deposited (or remains suspended in water), it is usually referred to as "sediment".

Senescence - The annual die-back of aquatic plants at the end of the growing season.

Series, soil - A group of soils that have profiles that are almost alike except for differences in texture of the surface layer or the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheetflow - Runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel.

Silvicultural Operations - The management of forested land in order to maximize the growth, health, and marketability of timber.

Sinkhole - A depression in the landscape where limestone has been dissolved. See Karst.

Soil Strata - the various horizontal layers of sedimentary rock (soil).

St. Marks Lowlands - A physiographic province which includes the present floodplain valley of the St. Marks River. It is marked by bottomland swamps of the St. Marks River and its major tributaries. A portion of the St. Marks River, below Cody Scarp, is made up primarily of groundwater flow.

Stormwater - Runoff and drainage from land surfaces resulting from precipitation including snow or ice melt.

Stormwater Management - A program of controls and measures designed to regulate the quantity and quality of stormwater from a development and/or land disturbance while promoting the protection and conservation of ground waters and groundwater recharge.

Swamp - Wetlands that unlike marshes, are dominated by woody plants such as trees, and shrubs. Swamp soils are saturated during the growing season, and standing water (from a few inches to a foot) is not uncommon at certain times of the year.

Tallahassee Red Hills - A physiographic region located in the northeastern portion of the County. It is a clayhills region composed of a moderately thick layer of sandy clay over limestones. It has substantial formation of sinkholes, karst depressions and valleys formed partly from solution of underlying limestone, and contains many lakes and seasonal streams and wetlands. Most of the limestones represent the Floridan Aquifer.

Total Suspended Solids (TSS) - Solids either floating or suspended in water, sewage, or other liquid wastes and that are removable by filtering.

Watercourse - A stream of water; river; brook; creek; or a channel or ditch for water, whether natural or manmade. See "Channel".

Watershed - The entire region or area drained by a river or other body of water, whether natural or man-made.

Water Table - The upper surface of the free groundwater in a zone of saturation (indicates the uppermost extent of groundwater); locus of points in soil water at which hydraulic pressure is equal to atmospheric pressure.

Wetlands - Areas where water is the primary factor controlling the environment and the associated plant and animal life. These transitional habitats occur between upland and aquatic environments where the water table is at or near the surface of the land or where the land is covered by shallow water (less than 6 ft).

Whole Tree Harvesting - Forest management harvesting operations that involves the removal of the entire standing tree (stem, branches, leaves, and sometimes roots).

Woodville Karst Plain - A physiographic region located in the southeastern portion of the County near Woodville. It is a low plain consisting of sand a few feet thick over limestone. The entire area is a high recharge area for the Floridan Aquifer. It is currently composed of cypress swamps and pine plantations.

APPENDIX F
BIBLIOGRAPHY

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BIBLIOGRAPHY

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